

THE DENTAL PRACTITIONER

incorporating
THE DENTAL RECORD

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VOL. V, NO. 8

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References to dental literature should be recorded in the text, with the name of the author and the year of publication in parentheses. In the bibliography they should be arranged in alphabetical order in the following form, the abbreviations of periodicals being those adopted in the *World List of Scientific Periodicals* (1952), e.g.:—

SMITH, J. A. K. (1949), *Brit. dent. J.*, **86**, 271.

LEWIS, R. W. B. (1947), *The Jaws and Teeth*, 2nd ed., 471. London: Science Publishing Co.

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THE DENTAL PRACTITIONER

Incorporating the "Dental Record"

Vol. V, No. 8

April, 1955



EDITORIAL

HAIL AND FAREWELL!

THIS April issue is memorable in that for the first time it incorporates the *Dental Record*, which was first issued as long ago as 1881. Throughout its long history it has gained an international reputation of high standing in the field of dental science. It is a journal with distinguished traditions and we are deeply conscious of our added responsibilities. There is no question of allowing the excellent work that the *Dental Record* has performed over all these long years to lapse into limbo. Those aspects that are not common to both journals will continue, and it is hoped to include from time to time accounts of current research. The many societies who supported the *Record* are welcomed to the *Practitioner*. In keeping with this policy we feel that it would be unfortunate indeed if the well-known name of the *Record* should disappear entirely, and be lost to a new generation. The name is part of the history of dentistry in this country, and it has been decided that it should be perpetuated and incorporated into our title, so that commencing with the new volume in September the name of our journal will be *The Dental Practitioner and Record*. This journal now becomes the only completely independent dental journal in the country and its policy the publishing of scientific dental material. Once again we reiterate the fact that it is not our practice to become involved in matters of political consequence; there are

others able to take up the cudgels with the machinery of the State. Our excursions into political matters occur only on those few occasions when we feel that a question of ethics or treatment is involved. We, like the House of Lords, review the problems of the day, but like that noble body do not allow ourselves to venture into the realms of political finance. Our aim is to produce a journal worthy of the Dental Profession, and to maintain the art and science of Dental Surgery.

IMPORTANT NOTICE TO SUBSCRIBERS TO THE DENTAL RECORD

Now that the *Dental Record* has been incorporated in the *Dental Practitioner*, subscribers to the *Dental Record* will receive each month the specially enlarged *Dental Practitioner*, until the expiry date of their current subscription. Renewals will of course be dealt with from the offices of the *Dental Practitioner*, to which correspondence and remittances should in future be sent.

In the case of subscribers to both journals the expiry date of the subscription to the *Dental Practitioner* will be delayed to cover the outstanding portion of the subscription to the *Dental Record*. Letters will be sent to all such, giving details of the extension of subscription.

Payment by Bankers Order.—This convenient method of paying annual subscriptions is now widely used and we will gladly supply the relevant form on request. For those who already pay by this method, a form for amending the instructions to the Bank will be sent by us in due course.

THE DENTAL RECORD, 1881-1955

By LESLIE J. GODDEN, F.D.S. R.C.S. (Edin.), L.D.S. (Eng.)

THE latter half of the last century in this country saw the emergence of dentistry from empiricism and secret remedies to the scientific approach and widespread dissemination of knowledge. Intellectual giants of those days, in all branches of science, dissatisfied with pretence and in revolt against ecclesiastical suppression of free thought, extended the frontiers of knowledge and gave their discoveries openly to their fellow men. This was, of course, a flowering of the seed sown by others, for numbers of men of various nations had, often painfully and against great opposition, shown that the open-minded experimental approach was more fruitful than the acceptance of dogma.

These were the times in which the *Dental Record* was founded. Men of the first rank in the dental profession, realizing that education and the examination of those proposing to practise dentistry were necessary from every point of view, were pressing for facilities for the first and legislation to enforce the second. Combined with this, they realized the necessity for the organization of practitioners and the publication of news and information to those in practice. They saw the birth of the institutions they desired. The Act of 1878 was passed, education was being organized, the British Dental Association was established and it had its own journal; but the pressure of ideas was such that a further publication was thought to be necessary. The Dental Manufacturing Company therefore undertook to sponsor a journal to be wide in its interests and not to be used in its text pages as an advertising medium. The title, the *Dental Record*, was chosen and the first issue was published in July, 1881, with Thomas Gaddes as editor, a post he held for eight years. This title has now become the oldest of any dental journal in the English language, and the journal itself is the second oldest, the *British Dental Journal* being its senior by eighteen months.

In the introductory article to the first issue a paragraph says, "The educational

advancement of a body is always associated with the development of its literature. The *Dental Record* is the outcome of this advancement, and is necessitated by the spreading influence of Dentistry as a Profession. It will offer every facility for the publication of matters of interest to the profession, and thus give a stimulus to men to write and communicate the results of their research and experiences, and their opinions".

As with many another journal, the names of numbers of those who have served it have been lost, but in their anonymity they have given immortality to the many contributors of scientific articles whose work is the essential basis of such a journal. These servants of the *Record*, both professional and lay, gave their time and energies without stint, and their satisfaction lay in the fact that the journal continued and that its contribution to the spread of knowledge was appreciated. Those of the early days would be gratified if they could be aware of the fact that a large proportion of books and articles on every aspect of dental science require to refer to articles published in the journal which they established.

The last world war was a trying time for all journals, and the scarcity of paper, the disruption caused by bombing, and the fact that societies whose papers provided an important source of material had almost ceased to function, combined to make the production of an independent journal a matter of great difficulty. The editor of those days was Joseph Woods, of Manchester, and it is due to him and his devoted staff at Brock House that the *Dental Record* survived the war.

Wars bring changes, frequently in unforeseen ways, and among these have been the speeding-up of life and the modification of ideas to suit new conditions. The post-war conditions of dental trading compelled the Dental Manufacturing Company to decide, in July, 1947, that the production of a scientific journal could no longer be their responsibility, and they reluctantly came to the conclusion

that they must withdraw from it. If it had not been for the generous action of Mr. O. H. Rissen, the *Dental Record* would have ceased publication then. Fortunately it found a home in Mr. Rissen's organization, and furthermore acquired an additional friend in Professor Aitchison. To these, as well as to Messrs. Steadman and de Vere Green, it owes more than the present writer can say.

Now, having almost reached its seventy-fourth birthday it is merged with a younger colleague. Its memorial lies in the dental libraries of the world. At such a time it is appropriate that acknowledgement should be made on its behalf to those many people who have been its servants in the past: first, to the

Dental Manufacturing Company, who initiated it in the days when the profession was needing opportunities for the publication of original ideas, and who never sought to mingle advertisement with science but kept strictly to their trust; secondly to the man who, at no small inconvenience to his business, gave it a home during its last eight years; then to the many hardworking members of office staffs who gave all they could to their journal; and lastly to the contributors of its articles. In addition, the author of these notes would acknowledge his indebtedness to all who have been associated with him during his term of office, and whose help and guidance were so freely given and so essential to his work.

OUR PRESENT ATTITUDE TO ACRYLIC FILLINGS

By C.-H. FISCHER, DR. MED., DR. MED. DENT.

*Director of the Conservation Department of the Dental Institute of the University of Göttingen
(Director: Prof. W. Meyer, Dr. med., Dr. med. dent.)*

WHEN the self-curing acrylics fell into disrepute as filling materials because of their discoloration, we continued our clinical investigations and our experiments in the laboratory and have carefully followed the further development of acrylics. For this purpose we have lately particularly used the German "Palavit" in its latest modification and the English "Orthofil". We believe that the result of these investigations gives us reason to hope that with the materials at present used, no discoloration of the type observed with the previous products need be expected. This applies in particular to discoloration caused by the exposure to visible or invisible sun rays.

As regards the influence of this new material on the living pulp, nothing has to be added to the point of view hitherto professed by us. We believe that when the material is used in a doughy stage, as always recommended by us, and when a solid lining of oxyphosphate cement is placed and polymerization takes place in a relatively short space of time,

irreversible lesions of the pulp can be excluded when using self-curing acrylics for filling vital teeth. This conclusion is reached from the observation of several thousand fillings in vital teeth and our own histological investigations.

Lately we have devoted our special attention to the marginal seal of fillings because reports published abroad have time and again stressed the danger of a bad marginal seal and of secondary caries in connexion with this new material. Our attention was drawn to this danger by marginal discoloration which we also observed with silicate and porcelain inlays without, however, always finding signs of secondary caries in the discoloured margins. It is obvious that with a material satisfactory from the æsthetic point of view such as silicate cement and porcelain inlays as well as acrylic fillings, marginal discoloration will be plainly visible and in any case be far more noticeable than, for instance, in the case of a large gold inlay in an anterior tooth where the contrast with the dentine will be so strong as to obscure any slight discoloration of the gap.

Following the investigations carried out by our department, we have tried to find exact data for the marginal seal of different fillings from acrylic, alloy, and metal, and to lay down a system of points which would give a possibility of comparison without individual description of the various fillings. Complete



Fig. 1.—Diagram of filling with "feather edge".

marginal seal was given a point value of 10; insufficient seal, zero points. It is thus possible to grade the marginal seal of various materials from zero to 10. We admit that such a system, which has been carried out by Lüttge in this Department, will not stand up to a strict scientific criticism. We believe, however, that this type of control and valuation will give results suitable for clinical comparison and a basis for further discussion.

Such evaluation of three types of fillings, namely, metal inlays, alloy, and acrylic, all of which had been placed in this Department, showed that after varying periods of time the marginal seal deteriorates. However, this does not only occur with acrylic fillings, but in a similar way with alloys and inlays. It has, however, to be pointed out that the inlays were made from white metal, the margin of which is not so resistant as that of a gold inlay. Moreover, with this metal corrosion may occur which also affects the marginal seal. It is not intended in a short article of this kind to give in detail the results of these investigations, and this is to be reserved for a further more complete publication. In this paper we should only like to stress once more that observation of the marginal seal of various filling materials shows that the acrylic is certainly not the only product where the marginal seal deteriorates with the

progress of time. It has been our experience that very good results can to-day be obtained with self-curing filling materials provided a correct technique is followed both in the use of the material and in the preparation of the cavity and the finishing of the margin. It is by now clear which maxims have to govern such work.

In this connexion we cannot mention too often the so-called "feather edge" which is only too often overlooked in the case of materials of aesthetically perfect appearance. (Fig. 1.) This almost invisible "flash" allows debris to accumulate and sometimes splits off later on and endangers the margin of the filling. It has been our practice to check fillings very carefully whether a "flash" exists, even using a magnifying glass to make certain that after polishing no "feather edge" is left. For the same reason it has also been our practice to postpone finishing of an acrylic filling for at least 24 hours. This also gives a rest to the eye fatigued by the work and the subsequent checking can be done all the more carefully.

The problem of the shape of the margin of acrylic fillings is relevant for all cavities and shows the importance of correct position of the matrix. We have also stressed the importance of this point and should like to do so once more.

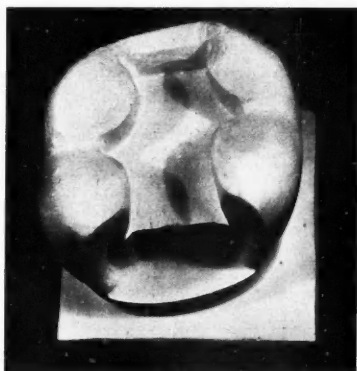
A further point to be borne in mind with acrylic fillings is the fact that in our experience the marginal seal of an acrylic filling will be all the better when the acrylic filling as a whole has sufficient bulk. We like to refer to an "acrylic block" which by its form has everywhere sufficient resistance to masticatory pressure and has no thin parts where the necessary bulk is missing. We also have to bear in mind that acrylic is resilient, and this fact, too, will influence the shaping of the cavity. It is necessary to ensure, in particular in the case of fillings with active surfaces exposed to masticatory stress, that the hardened acrylic block will everywhere find a resistance preventing it from bending and warping. Fig. 2 illustrates this principle in the case of a two-surface molar cavity where the "lock" prepared in all directions can be

clearly noticed. This maxim can also be applied to the preparation of all other cavities in which this material is to be used.

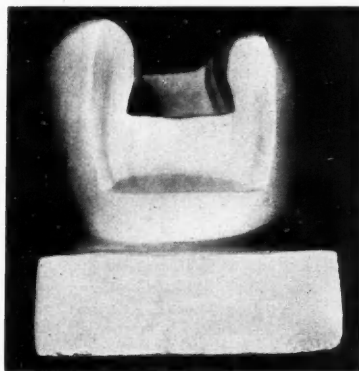
Time and again the objection is raised that in shallow cavities it is impossible to place a lining and to insert a strong "block" of acrylic. It is true that there are teeth where

of incisors and the possibilities offered by the acrylic. The aesthetic effect of the acrylic filling is always a temptation. The marginal seal, however, is still not as good as with a gold inlay.

It is not the purpose of this report to plead for a replacement of the time-tested filling



A



B

Fig. 2.—"Lock" preparation of cavity—essential for acrylic filling. A, Occlusal view; B, Mesial view.

sufficient cavity preparation is impossible without endangering the pulp. We therefore have to get used to limiting the indication of filling materials as we do in the case of medicaments, and not to choose at random any type of filling material for any cavity. We have to make a choice between the materials at our disposal, and the indications of acrylic fillings have now become clear. It is certain that as far as marginal seal is concerned, the most favourable results will be obtained with a gold inlay. There are, however, indications where inlays, and especially gold inlays, cannot be used. Let us think of the restoration

materials by the acrylics. We should only like to point out that self-curing acrylic, when used correctly as a plastic filling material, will certainly give better results than is frequently assumed. We therefore agree with G. H. Leatherman, who stated some time ago (*Brit. dent. J.*, 1953, p. 124) "The material must be handled with skill, knowledge, and intelligence. If this is done one will get good results."

"The material will undoubtedly be abused and probably be condemned, but in my opinion it is here to stay and, with further research and improvements, will be the accepted and universal filling material of the future".

The Dimension of Instruments for removal of Subgingival Calculus

By the superimposition of photographs of instruments commonly used for the removal of subgingival calculus on photomicrographs, attention is drawn to the inability in many sites for instruments to get beneath the calculus due to the bulk of soft tissues and even bone in the interdental areas. It is

concluded that an instrument for use in deep periodontal pockets should be not greater than 0.6 mm. in width between the cutting edge and the back of the shank whilst one of 0.4 mm. appears to be most satisfactory. It was found that curettes could only be used satisfactorily in pockets which were not deeper than 4.0 mm. —WAERHAUG, J., ARNO, A., and LOVDAL, A. (1954), *J. Periodont.*, 25, 281.

THE DESIGN OF REMOVABLE APPLIANCES FOR INTERMAXILLARY AND EXTRA-ORAL TRACTION

By C. P. ADAMS, B.D.S., F.D.S.

THE use of intermaxillary and extra-oral traction with removable appliances is not a new idea. Intermaxillary traction has frequently in the past been successfully applied to plates clasped to the dental arches with Tischler arrowhead clasps. The introduction

arrowhead clasp to increase retention of the appliance. It is not so much that the appliance requires to be fiercely clasped to the teeth but that it needs to be positively supported at each corner, so that levering and tipping effects are resisted.

THE LOWER TRACTION APPLIANCE

The standard lower traction appliance is clasped on the first premolars and first permanent molars (*Fig. 1*). This ensures that the plate will not move or lift up under the tension of the elastic traction. In some instances this ideal retention is not available because the first premolar has not erupted. It is then necessary to adopt the expedient of putting an auxiliary arrowhead clasp on a second deciduous molar. The lower traction hook on the first permanent molar may be of the standard type, or if necessary one of the special variations (Adams, 1954), depending on the depth of the buccal sulcus in the molar region.

A most important feature of the lower traction plate is the labial bow. This bow is not a retention device, but serves the important purpose of preventing proclination of the lower incisors. The bow must lie accurately against the labial surfaces of the incisors and canines nearly at their incisal edges (*Fig. 2*). These teeth are thus prevented from inclining forward under the pressure exerted on them from behind and so become very much more resistant to movement than if they are simply permitted to tilt forward. An element of 'stationary anchorage' is therefore obtained. This bow also locks the six front teeth into a rigid block against the baseplate and so prevents mesiodistal movement which would result in rotations and imbrications. As a result of these arrangements the lower traction plate creates out of the lower dental arch an almost completely rigid base from which to exert traction on the upper dentition.

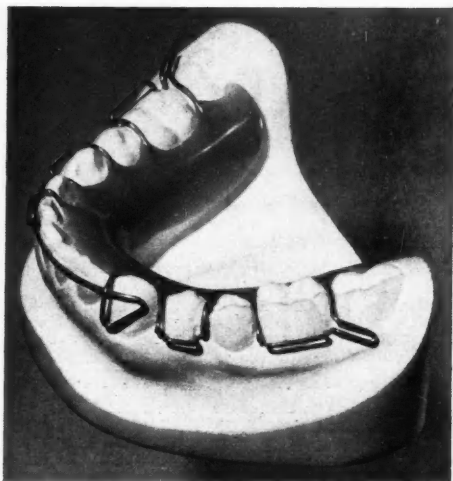


Fig. 1.—The lower traction plate. The standard traction hook is here in use. Note that the labial bow fits all teeth very accurately.

of the modified arrowhead clasp has greatly simplified the design and construction of traction appliances and made possible the use of extra-oral traction and free sliding labial arches on removable appliances.

The general design of traction plates does not differ greatly from that of ordinary upper or lower removable appliances. It will be realized that firm retention for the appliances will be necessary so that four clasps on each plate are normally required. Where four claspable teeth are not present in the arch concerned, use may be made of the accessory

The arrangement of the lower labial bow should be carefully noted. As the embrasures between the canines and the first premolars are already occupied by the wire of the premolar clasp, the tags of the bow are brought

arch, with less likelihood of upsetting the alinement of the front teeth, than any of the conventional appliances of the labiolingual type, and there are the additional advantages of ease and speed of construction and all the

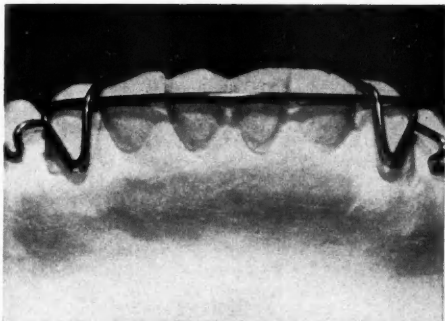


Fig. 2.—The labial bow on the lower traction plate is placed as near the incisal edges as possible.

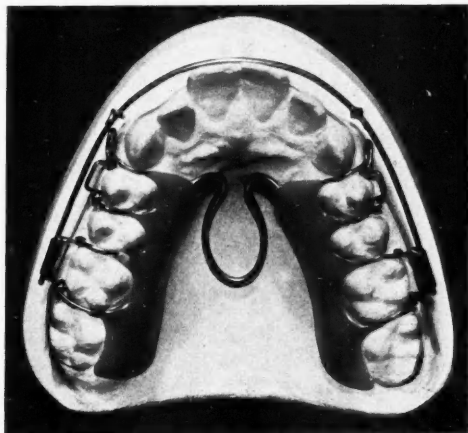


Fig. 4.—Upper traction plate for retroclination of upper incisors and canines. The free-sliding arch is of 1.0-mm. wire. Note Crozat type of expansion arch as an alternative to the screw in Fig. 3.

lingually between the canines and the lateral incisors. The wire used for the bow should be 0.6 mm. thick and will not interfere with the occlusion.

Both theoretically and in practice a plate of this kind when properly constructed will give more reliable anchorage from the lower

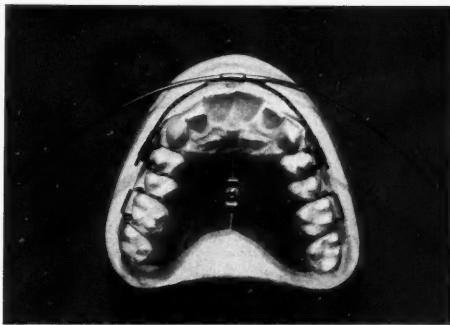


Fig. 3.—Upper traction plate for distal movement of buccal segments. If only intermaxillary traction is being used, the tubes on the premolar clasps and the extra-oral arch are unnecessary. Note the expansion screw. This is not necessarily for active expansion of the upper arch.

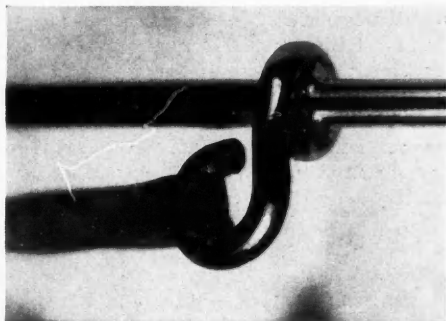


Fig. 5.—Stop hooks on free sliding labial arch on appliance in Fig. 4. Hooks of 0.7-mm. soft wire soldered on. Elastic in position.

convenience of a removable appliance where cleanliness and the health of the soft and hard tissues are concerned.

UPPER TRACTION APPLIANCES

Upper traction appliances vary, depending on the kind of tooth movement required, but all consist essentially of a baseplate clasped

to the first premolars and first molars and provided with a means of expanding the base-plate in a lateral direction. This expansion mechanism is not provided, however, for the purpose of actively expanding the arch laterally, but is for the purpose of permitting

instance in cases where spacing occurs between the buccal segments and the canines, the lower plate is constructed with a lingual arch standing well clear of the gingival tissues behind the lower incisors and canines, and no labial arch. The whole plate can then come

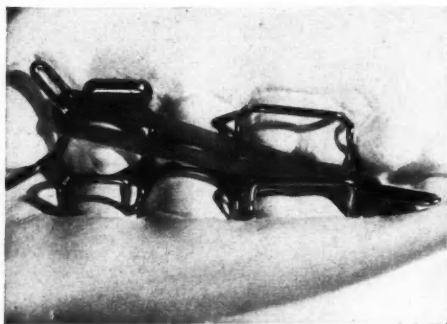


Fig. 6.—Intermaxillary traction to retract upper buccal segments. Note how elastic comes from distal aspect of lower molar to mesial aspect of upper premolar and elastic lies almost horizontally.

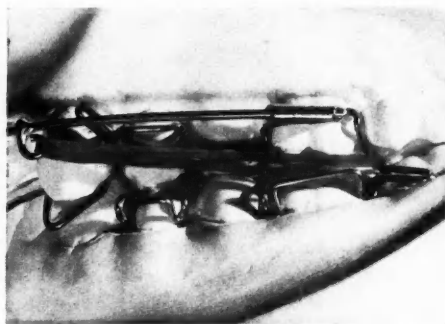


Fig. 7.—Intermaxillary traction to upper free-sliding arch to retract upper incisors. Note that traction is almost horizontal.

expansion of the plate following upon the distal movement of the upper buccal segments. This distal movement is usually accompanied by an expansion, because the teeth in moving distally move on to a wider part of the arch. The expansion mechanism may be either the conventional screw or the Crozat type of expansion arch.

The standard type of traction plate is clasped to the first premolars and first molars, and hooks are incorporated in the first premolar clasps. When used in this form this plate is designed to produce distal movement of the buccal segments only (Fig. 3). By dividing the operation of moving the upper arch distally into two stages, moving the buccal segments distally first, then retracting the upper incisors and canines separately, the strain on the anchorage of the lower arch can be reduced. Lighter elastic tensions can be used to produce movement of the two parts of the upper arch than would be required if the upper arch were to be moved as a whole.

If of course it is desired to bring the lower buccal segments forward, as is required for

forward slightly under the influence of the intermaxillary traction. It may be necessary to fit a Crozat type of lingual arch to permit contraction of the appliance a little as the buccal segments come forward, but this is not usually necessary.

When the buccal segments have been retracted and it is desired to retract the incisors and canines, a free-sliding labial arch may be added to the upper appliance running in tubes soldered to the molar clasps (Fig. 4). These tubes may be placed on the clasps from the outset in anticipation of the second phase of treatment or they may easily be added later when required.

It is necessary to make the free-sliding arch of a fairly substantial wire, 1.0-mm. or 0.9-mm. thick at least, and to match the arch wire carefully with the tubing in order to ensure that the arch runs freely in the buccal tubes.

The traction hook on the buccal arch, Fig. 5, is also designed to serve the purpose of providing a firm and indestructible stop for extra-oral traction and is therefore called the "stop hook". It is made from 0.7-mm. soft

stainless steel wire turned accurately round the arch wire and soldered. The free end is then turned backwards and finished off under the arch as shown.

It will be seen that the intermaxillary traction produced by both these upper traction appliances and the standard lower traction appliance is almost horizontal when the teeth are in occlusion and there is very little vertical component (*Figs. 6, 7*).

When the distal movement of the upper arch is carried out as a two-stage operation—distal movement of the buccal segments followed by retroclination of the upper incisors and canines—it may be considered necessary to stabilize the buccal segments during the second stage of treatment in case there is any tendency to relapse. This can be done by placing coil springs on the upper free sliding buccal arch between the stop hooks and the molar tubes.

These coil springs should be of very fine wire, 0.15-mm. thick, and lie between the distal aspect of the stop-hooks and the mesial ends of the tubes. When slightly compressed the springs will exert the necessary gentle stabilizing pressure on the buccal segments. The main pressure will continue to be exerted by the arch anteriorly on the incisors. The correction of the buccal segment and incisor relation in *Fig. 8 A, B* was carried out as a two-stage operation using intermaxillary traction alone.

EXTRA-ORAL TRACTION

The tendency for intermaxillary traction to upset the lower arch by bringing buccal segments forward and producing imbrication of incisors is well known. This tendency can be reduced or eliminated by careful construction of the lower appliance and judicious adjustment of the tension applied to the lower arch.

The use of extra-oral traction as the main moving pressure in retraction of the upper arch, with intermaxillary traction as a day-time stabilizing pressure only, practically eliminates any risk of seriously upsetting the lower dental arch at all.

There is a strong tendency to-day to depend less on intermaxillary traction for

the correction of buccal segment relations and to use extra-oral traction to expedite treatment and reduce stress on the lower arch. It has been found, however, that the

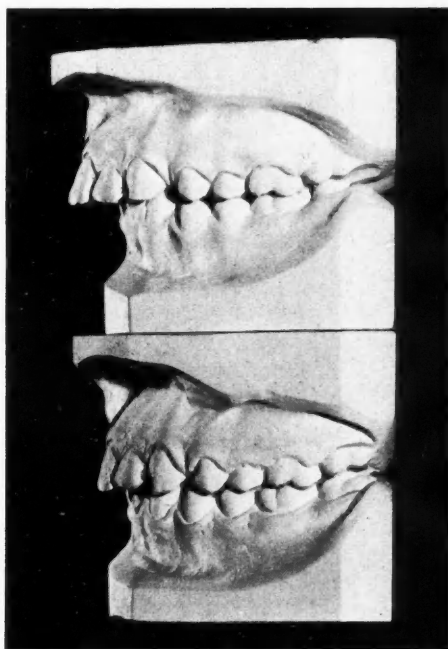


Fig. 8.—Treatment of Class II, Div. 1 malocclusion with intermaxillary traction. This was done as a two-stage operation. No stabilization of buccal segments was used during the second phase of treatment.

use of day-time intermaxillary traction to stabilize advances gained on the upper arch during the night is an important detail that should not be omitted.

The Extra-oral Headgear.—Many different kinds of extra-oral headgear have been described in the past, but they all fall into one of two general types, the cervical type and the headcap type. The only difference in principle between the two is that with a headcap it is possible to vary the direction of pull to some extent, while the cervical traction collar as a rule sits in one position only on the patient's neck and tends to pull slightly in a

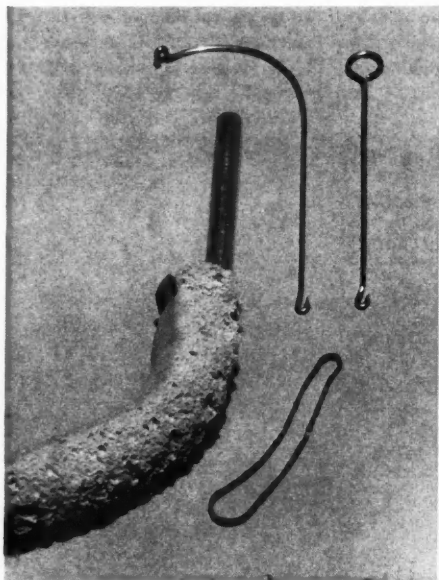


Fig. 9.—The rigid-tube cervical traction attachment. This shows exactly half of the tubular collar and two types of extra-oral arm. The sorbo rubber is sewn on while the tube, 12 in. by $\frac{1}{4}$ in. duralumin tube, is straight. The tube and rubber are then bent to fit the patient's neck, avoiding the angles of the mandible. A sufficient length at the sides must be left straight in which the wire arms (1.25 mm. thick) will run. The elastic is 2-3 in. by $\frac{1}{8}$ in.- $\frac{1}{4}$ in. wide and is pulled through with a length of 0.6 mm. wire, the inside of the tube being well dusted with french chalk.

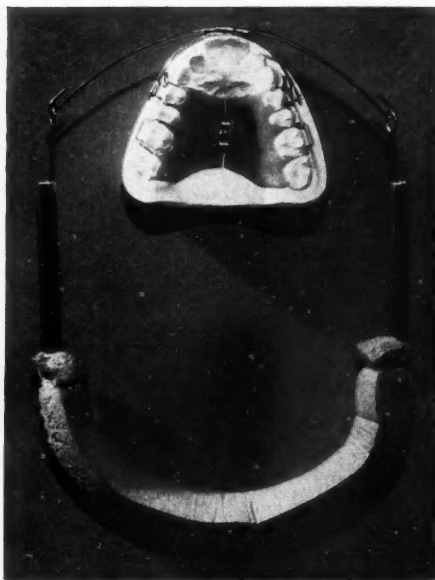


Fig. 10.—Extra-oral traction for distal movement of upper buccal segments. The extra-oral wires are 1.25-mm. thick, the small labial bow 1.0-mm. thick. The tubes are soldered to the premolar clasps and the small labial bow plugs in to the tubes. The labial bow is prevented from touching the upper incisors by means of friction fit movable stops. (See also Fig. 3.)

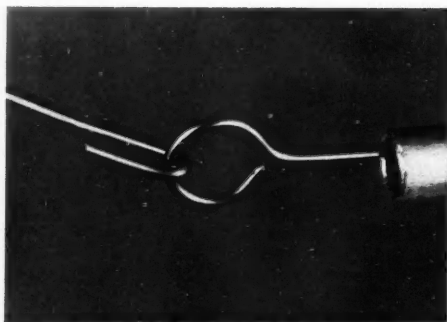


Fig. 11.—Detail of the connexion between the extra-oral wire arm and the extra-oral bow. This connexion is easily made and undone by the patient.



Fig. 12.—Cervical traction in position. This photograph shows an earlier form of hook connexion with the extra-oral arm. The general arrangement is otherwise the same.

downward direction. In practice it is found that the direction of pull is not critical and that with removable appliances of the kind described, there is no tendency for the cervical traction to displace the upper appliance even when the maximum grasp of the clasps is not exerted.

The Cervical Attachment.—A convenient form of cervical attachment is the U-shaped aluminium tube with a sorbo rubber strip sewn around it at the posterior part where pressure is produced on the back of the neck. This tube supports and guides the two extra-oral arms through which traction is brought to the intra-oral appliance, and contains the long elastic band from which the tension is derived (Fig. 9).

The details of the connexion between the extra-oral attachment and the upper appliance will vary with the type of appliance in use.

For the upper appliance that is being used only to retract the upper buccal segments it is most convenient to provide an attachment which plugs into tubes soldered to the first premolar clasps (Figs. 3 and 10). This attachment consists of a short labial arch made of 1.0-mm. wire and provided with Trevor Johnson friction fit stops (Johnson, 1952) which hold it forward and well clear of the labial surfaces of the incisors. The extra-oral bow is made from a single piece of heavy wire, 1.25 mm., which is wrapped to the smaller arch with soft fine stainless steel wire, 0.3-mm., and soldered. The ends of this bow are turned into convenient hooks.

The arms of the cervical attachment, for use in conjunction with this type of extra-oral bow, are turned into large circular loops which can be easily engaged and disengaged by the patient (Fig. 11). Fig. 12 shows the complete extra-oral attachment in position. An older type of connexion between the extra-oral arm and the bow of the cervical attachment is actually in use in this illustration. The extra-oral attachment can be fitted on to the plate by the patient on retiring at night and removed in the morning. Intermaxillary traction is discontinued during the night. Fig. 13 A, B shows the distal movement of upper buccal segments by the methods described.

If the upper appliance is of the kind that is fitted with a free-sliding labial bow for retraction of the upper incisors, the details of the connexion with the cervical traction are

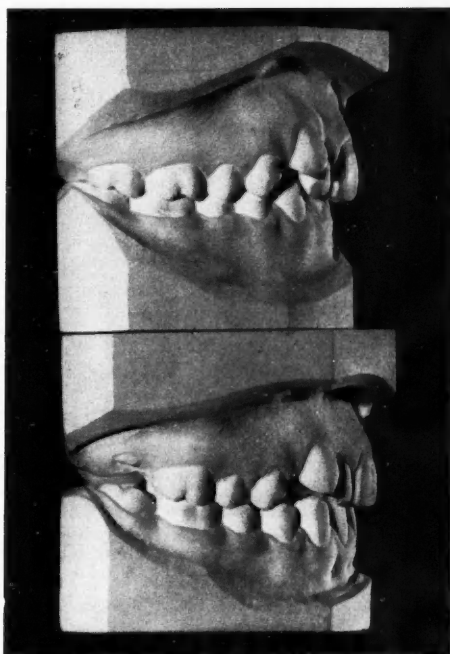


Fig. 13.—A, B, Retraction of upper buccal segments with extra-oral and intermaxillary traction. The upper second molars have been removed and the upper third molars are just appearing in B. 3/3 were brought completely into line in the arch. Patient aged 20.

slightly different. The arms which emerge from the cervical tube curve forward and inward and are formed into hooks which fit over the buccal arch and impinge on the front of the stop hooks (Figs. 14, 15). Where this appliance is in use, the patient at night removes the intermaxillary elastics and puts on the cervical traction appliance. In the morning the extra-oral traction is removed and new intermaxillary elastics put in place.

Other kinds of cervical attachment have been described and are regularly in use (McCallin, 1954). Some are made of webbing (Fig. 16), and others of more flexible kinds of

plastic tubing. All have their advocates and are perfectly effective; it merely remains for the operator to select the one that accords best with his preferences. It will be found,

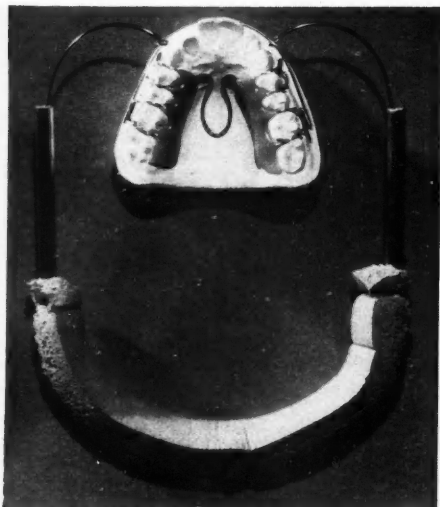


Fig. 14.—Retraction of upper incisors with extra-oral traction.



Fig. 15.—Detail showing engagement of extra-oral hook with the stop hook on the free-sliding labial bow, 1.0-mm. Stop hook 0.7-mm. soft wire.

however, on the whole that the curved type of extra-oral arm shown in Fig. 14 works best if it runs in a rigid metal tube.

The Headcap.—The webbing or net headcap has the advantage that the direction of pull may be varied in a vertical direction, and in

some cases it may be thought better to have the pull coming from a higher point than would be possible with cervical traction. Headcap design varies, but the essential features are a coronal band, a horizontal band running around the brow and around the backmost part of the head, and a median sagittal band which provides a tab anteriorly to help in pulling on the headcap. A second horizontal band is provided which runs around the back of the head at a level designed to give the required direction of pull. This last horizontal band is attached to the sagittal band posteriorly and to the ends of the coronal band laterally.

Attachment of the elastics to the headcap is effected by means of large-sized hooks of the "hook and eye" type. It is usual to use fairly short elastics, although the hooks may be placed at any point along the horizontal band of webbing to enable the operator to use any length of elastic he may wish.

The headcap is constructed by pinning or stapling it together and trying on the patient's head, after which it is sewn permanently

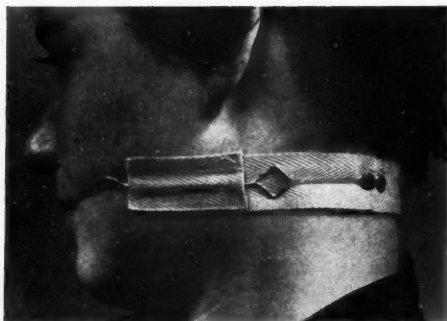


Fig. 16.—An alternative form of cervical attachment made of webbing 1 in. wide. The elastic is looped through two closely placed eyeleted holes. The extra-oral arm has a large loop on it to prevent rotation of the arm and facilitate alinement of the loop at its anterior end.

together and the hooks placed in position (Fig. 17).

The design of webbing headcaps may of course be varied according to the needs of the

case and the operator's own ideas, and other materials than webbing may be used in their construction.



Fig. 17.—The webbing headcap. The lowermost horizontal band to which the hook and elastic are attached can be arranged at whatever height seems convenient and the direction of pull thereby controlled.

Plastic belt material has been used successfully for headcap construction. This material is easily joined by running a clean hot wax knife between the two surfaces to be united and pressing the two parts firmly together. Heated hooks may be bedded in the material and sealed in with a hot knife (Fig. 18).

The author is greatly indebted to Mr. S. G. McCallin for permission to use Figs. 8, 12, 16, 17, and 18, and for his enthusiasm in the development of new types of headcaps and

cervical anchorage attachments; to Mr. C. V. Hill, who introduced to this country the aluminium tube type of cervical attachment



Fig. 18.—The plastic headcap. In this particular model no horizontal band encircling the head has been incorporated. The sagittal band is not visible, but is in fact used.

referred to; and to Mr. D. R. McDougall, A.I.B.P., of the Photographic Department, Institute of Dental Surgery, for his care in the preparation of the illustrations.

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The Psychosomatic Aspect of Periodontal Disease

The basic concept of the relation between the psyche and the soma is explained and eight possible relations between the psyche and periodontal lesions are briefly discussed. These are: reduction of local nutrition through vascular changes; increased bacterial flora; development of habits, both objective and subjective, which are harmful to the health

of the periodontal structures; inducement of excessive chewing, clenching, or grinding; taste perversions causing the ingestion of foods which are locally and systemically harmful to periodontal health; permitting insufficient food intake through limitation of gastrointestinal function; producing neglect of oral sanitation, and by causing bodily conditions inimical to the health of the periodontal tissues.
—KANTERMAN, C. B. (1955), *J. Periodont.*, **26**, 47.

A RADIOGRAPHIC STUDY OF MOVEMENTS OF THE TONGUE IN SWALLOWING*

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A PRELIMINARY communication upon the general features of the mechanism of swallowing has been given (Ardran and Kemp, 1951). The present paper describes the movements of the tongue in further detail. The material studied comprises cineradiographic examinations of approximately 250 adults of both sexes, under 30 years of age. None of the persons examined had any gross facial or associated dental deformities, or known abnormalities of speech or swallowing; they included persons with full dentition, those who had lost some teeth, and edentulous persons with and without artificial teeth.

The method of examination was cineradiography at 25 frames per second, as previously described. In the last eighteen months X-ray image intensification has been available, thereby making it possible to perform examinations with a considerable reduction in X-ray dosage (Ardran and Wyatt, 1954). The contrast medium has been barium sulphate in large and small amounts, of varying consistency, with and without the addition of food. Anteroposterior, lateral, and oblique projections were taken in the erect, supine, prone, right and left lateral, and inverted positions. The range of examinations performed upon a single individual was varied. Without image intensification, usually not more than four series of cineradiographs were made upon a single individual at one time, but with image intensification in some instances as many as twelve examinations have been made. The usual duration of a single examination was 4 sec., but sometimes a longer exposure was used.

* This paper is based upon a demonstration of cineradiographic films of deglutition given before the British Society for the Study of Orthodontics on Dec. 13, 1954. Certain aspects of the work have already been published. Further papers relating to the movement of the soft palate and of deglutition in infants are to be published elsewhere.

RESULTS

We have learnt to distinguish between the movements necessary for taking food into the mouth, mastication, and the preparation of the bolus, and those necessary for the act of swallowing; these actions may overlap. The movements of the tongue in swallowing will be described first, followed by a description of the different methods of taking food into the mouth.

Swallowing a Small Mouthful.—Each subject was given a dessertspoonful of barium cream and asked to hold it in the mouth in preparation for swallowing.

In the erect position a small fluid bolus rests in a depression upon the upper surface of the forepart of the tongue (*Fig. 1 A*). Spill over the back of the tongue is prevented by arching the tongue behind the bolus and by apposition of the dorsal surface of the tongue to the ventral surface of the soft palate; the apex of the bolus usually projects backwards a little beyond the posterior edge of the hard palate. Spill along the sides of the tongue is prevented by contact between the tongue and the lateral walls and isthmus of the fauces; this contact extends, from the pterygo-mandibular ligaments backwards to the posterior pillars. The jaws may be slightly parted or held in the occlusive position. In some individuals the hyoid bone may be slightly elevated.

When swallowing begins the tip of the tongue is thrust forwards against the upper incisor teeth and the posterior surface of the gums, or against the upper alveolus if there are no teeth (*Fig. 1 E*). The tongue is then pressed upwards and forwards against the hard palate, being opposed from before backwards so that the bolus is expressed backwards as if it were tooth-paste being pressed from a tube (*Fig. 1 E-M*). In some subjects the forepart of the tongue rises against the hard palate in the manner depicted in *Fig. 1 F-J*, the

elevation presenting an almost vertical surface to the bolus. In others, the tongue maintains a convex upper surface, as shown in Fig. 3 C, F. As the front of the tongue is raised the arched dorsal surface is lowered, the forepart of the soft palate is depressed and bowed forwards into the mouth cavity, and the seal between the tongue and palate is maintained (Figs. 1 D-G, 3 C). As the dorsum of the tongue is further depressed, contact between the soft palate and the tongue is lost from before backwards; the soft palate shortens and thickens and then begins to rise towards the posterior wall of the pharynx, becoming bent in the form of an inverted "V", the axis of the movement being in the general direction of the plane of the fibres of the levator palati muscles. As the soft palate rises, the bolus is often held up momentarily at the level of the anterior pillars of the fauces. The bolus then passes through the anterior pillars and descends upon the sloped dorsal surface of the tongue into the valleculæ. Meanwhile the mesopharynx is narrowed and the opening into the nasopharynx is closed off. When the apex of the bolus reaches the valleculæ it is held up upon the epiglottis, which has been tipped backwards against the posterior pharyngeal wall, but some of the bolus soon spills over the lateral pharyngo-epiglottic folds into the lateral food channels and descends quickly on one or both sides of the larynx into the pharyngo-laryngeal recesses and the œsophagus. The main mass of the bolus is thrust backwards into the pharynx as the superior surface of the tongue is applied, first to the hard palate and then to the soft palate. The slope of the dorsum of the tongue is meanwhile progressively increased and becomes vertical as the last of the bolus is expressed from the mouth; return to the mouth is prevented by the mass of the tongue (Fig. 1 K-M).

When swallowing begins, the teeth may be in apposition or slightly parted. As the tongue rises against the palate, the mandible is elevated and the gap between the teeth or gums is progressively reduced while the bolus is expressed from the mouth (Fig. 1).

The movements of the hyoid bone in relation to the movements of the tongue and of the

bolus have not been fully analysed; the body of the hyoid bone is usually lifted to the level of the lower border of the mandible as the tongue rises in the forepart of the mouth and is drawn forwards as the main mass of the bolus descends through the mesopharynx (Fig. 1). In some subjects these movements appear to be combined, the body of the hyoid moving diagonally upwards and forwards. During these movements the hyoid bone is tilted slightly backwards.

In the concluding phase of the second stage of swallowing the tongue arches backwards into the pharynx and the posterior pharyngeal wall is brought forwards to meet it. Apposition takes place from above downwards, with the result that the food is pressed downwards. The larynx is arched backwards and the tongue of the epiglottis is turned downwards (Ardran and Kemp, 1952).

In the anterior projection it may be difficult to visualize the act of swallowing in its entirety on account of the density of the superimposed skull. The bolus passes over the upper surface of the forepart of the tongue in a central furrow. Spill into the cheek cavities is prevented by apposition between the sides of the tongue, the teeth, and the gums. As the tongue rises in the forepart of the mouth the central furrow is obliterated. The bolus is expressed backwards and compressed from below and from the sides; it descends into the pharynx upon the midline of the tongue, and as it reaches the epiglottis it is directed by the glosso-epiglottic fold into the valleculæ.

After the last of the bolus has been displaced from the pharynx there is a pause of about 0.2 sec. while the bolus passes down the œsophagus. Re-inflation of the airways takes place from the larynx below and from the pharynx above; the larynx descends and the tongue is lowered and brought forward. The body of the hyoid bone usually descends diagonally downwards and backwards to its position of rest, but in some instances it may first move backward and then descend.

Residues.—The first swallow usually leaves a thin coating of barium on the mucous membrane of the mouth. In some subjects the tongue may leave a small residue beneath the

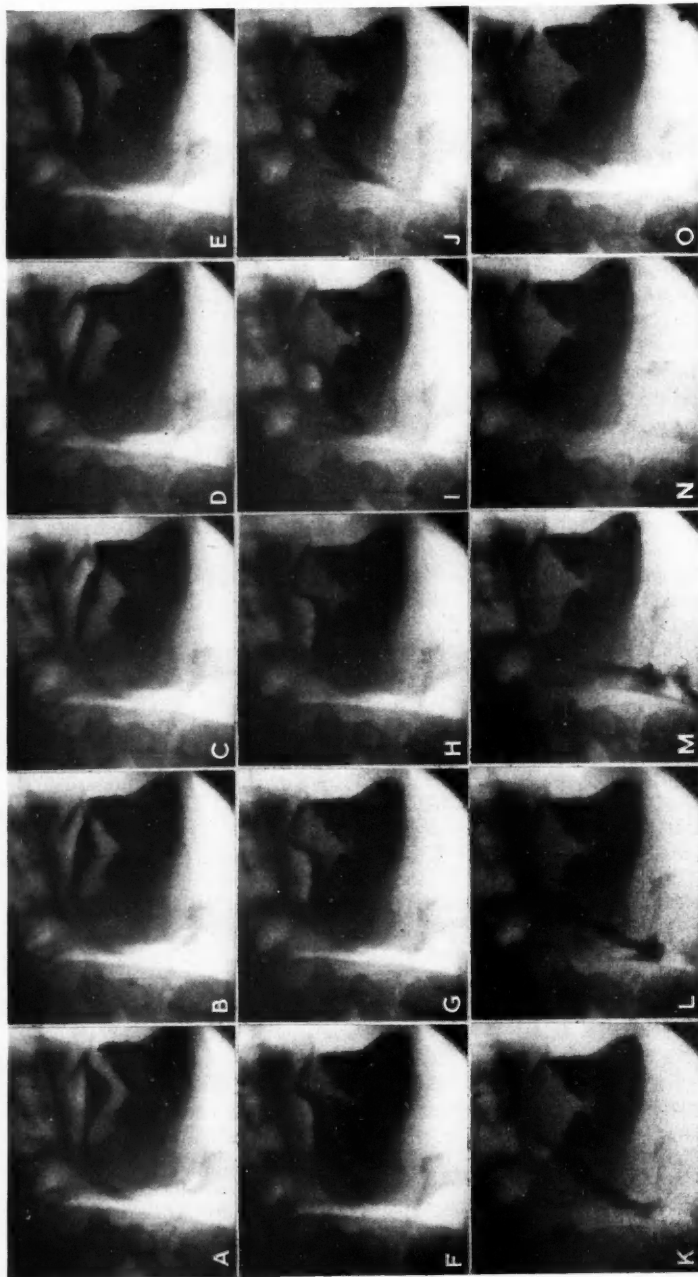


Fig. 1.—Selected from a film taken at 25 frames per second. Swallowing a small bolus. The films of this subject were chosen since the partially edentulous state allows the tongue to be seen clearly.

A, frame 1. A small fluid bolus rests in a hollow on the forepart of the tongue. The air above the fluid level must be considered as part of the bolus and is swallowed as such.

B, frame 2; C, frame 4; D, frame 5. The tip of the tongue is withdrawn to the floor of the mouth; this is frequently, but not invariably, observed prior to the initiation of swallowing.

E, frame 8. Elevation of the tip of the tongue to the upper gum, or incisor teeth when not edentulous.

F, frame 11; G, frame 12; H, frame 15; I, frame 20. Progressive apposition of the tongue to the hard palate displaces the bolus of air and barium emulsion backwards into the pharynx. Palatoglossal closure is maintained until (I). The hyoid is moved forwards.

K, frame 21; L, frame 22; M, frame 23. Increasing slope of the posterior surface of the tongue.

N, frame 30. Tongue coated with barium: bolus stripped from pharynx.

O, frame 35. Reinflation of the airway. Return of hyoid bone to normal position. Tongue apposed to palate.

Note: The movements of the hyoid bone in this individual are not typical in that elevation is minimal.

dome of the hard palate. There is usually a small residue on the soft palate and tongue in front of the anterior pillars; this is returned to the forepart of the mouth as the pharynx is stripped of its contents. Another small residue is invariably left in the valleculæ. The presence of this and its relation to the laryngeal airway has been previously described (Ardran and Kemp, 1952).

Swallowing a large Mouthful of Fluid.—Each subject was asked to fill the mouth with barium emulsion; 4–5 oz. of barium emulsion may be taken into the mouth cavity, most of it being held in the vestibule (the cavity between the alveolar margins, the cheeks, and the lips). Spill into the pharynx is prevented by the tongue and the soft palate in the manner already described (Fig. 2 A).

The position of the tongue and its movements are in part obscured by opaque medium held in the cavities of the cheeks, but if a suitable dilution of barium emulsion is used the main details can be discerned. The contents of the mouth are swallowed as a series of boluses, two, three, or four, of various sizes. Before swallowing is begun, a quantity of barium emulsion collects in the forepart of the mouth in a cavity formed by retraction of the apex of the tongue into the floor of the mouth. When swallowing begins most of the barium contained in this cavity is lifted upon the tongue towards the hard palate; the apex of the tongue is thrust forwards against the back of the upper incisor teeth and the tongue is then progressively apposed to the hard palate from before backwards so that the barium is displaced backwards. When the apex of the bolus reaches the back of the mouth, the soft palate is elevated and the raised dorsal surface of the tongue is lowered; some of the mass of barium carried upon the upper surface of the tongue is then allowed to pass into the mesopharynx (Fig. 2 B). But, before all of this barium is cleared from the mouth, the dorsum of the tongue again rises quickly against the front of the soft palate and cuts the barium column in two (Fig. 2 C). The quantity of barium allowed to escape into the mesopharynx, the bolus, varies in successive acts of swallowing, from a small fraction to the

greater part of that which was carried on the tongue. The bolus passes downwards into the oesophagus whereas the barium left on the tongue is returned to the forepart of the mouth, where it is joined by barium expressed from the vestibule. One swallowing act succeeds another until the mouth is emptied of its contents (Fig. 2 D-I).

The passage of each bolus through the pharynx is similar to that observed on swallowing a small mouthful as a single bolus, except in the following respects: With the swallowing of the first bolus the larynx is closed and arched backwards and the epiglottis is turned down. Unless there is a break in the sequence of swallowing movements the larynx remains closed and the epiglottis stays down. During each act of swallowing, so long as the mouth is distended with barium, the arched dorsal surface of the tongue is lowered only enough to allow the bolus to pass through the anterior pillars and then it is quickly raised. Thus the tongue rises to block the exit from the mouth and so prevents the contents from flooding into the pharynx. Backward movement of the tongue is limited; as the posterior wall of the pharynx is unable to move far enough forwards to meet the tongue, clearance of the bolus from the mesopharynx is defective. When the mouth is nearly empty, swallowing of the remaining contents is completed in the manner described for swallowing a small mouthful, the tongue arching backwards to meet the posterior pharyngeal wall so that the pharynx is stripped of its contents.

The mandible is elevated as each bolus is expressed into the pharynx; it is lowered to facilitate emptying of the cheeks. The hyoid bone, having been lifted with the displacement of the first bolus into the pharynx, is lowered while the pharynx is refilling with the second bolus. It is again elevated as the tongue rises to pinch off the second bolus.

Taking Food into the Mouth.—In the adult there are three ways of taking foodstuffs into the mouth:—

1. Suction.
2. By pouring or dropping.
3. By placing the foodstuff into the mouth with the fingers or with an implement such as

a spoon or fork. When an implement is used the foodstuff is usually scraped off it by withdrawal through the apposed teeth and lips.

Sucking through a Straw.—Each subject was

asked to suck barium emulsion with a straw from a glass.

The straw is adjusted so that its proximal end is just inside the mouth cavity proper and the distal end beneath the surface of the fluid.

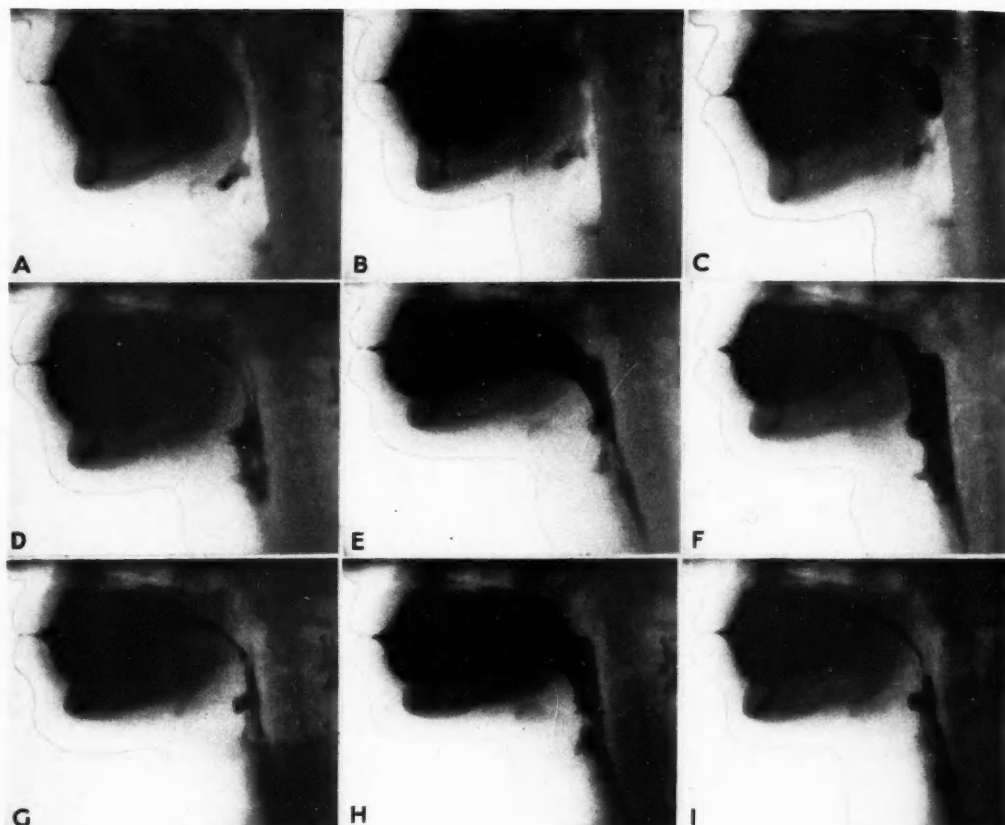


Fig. 2.—A large mouthful of fluid barium emulsion.

- A, frame 1. Prior to swallowing. There is a little air beneath the hard palate.
- B, frame 4. The palate has been elevated sufficiently to allow the air and a little barium to pass.
- C, frame 8. The tongue has elevated against the junction of the hard and soft palates, cutting off the first bolus.
- D, frame 13. Passage of the first bolus through the pharynx.
- E, frame 19. The tongue lowered to permit the passage of the second bolus.
- F, frame 24. The second bolus cut off. Compare with C.
- G, frame 32. Tongue falling to allow passage of third bolus. Barium in the pharynx remains from the second bolus indicating poor stripping action.
- H, frame 36. Third bolus entering pharynx.
- I, frame 45. Third bolus swallowed. Poor pharyngeal clearance.

Note: The hyoid bone is elevated and partly obscured by the lower border of the mandible; maximum elevation is associated with elevation of the tongue (C, D, F, and I). Movement of the hyoid forward is minimal. The larynx is elevated and closed with the passage of the first bolus (D) and remains closed during the passage of subsequent boluses.

The glass is raised to a comfortable height, the lips are closed around the straw and the head may be slightly bowed forwards. There may be a small quantity of air in the mouth between the forepart of the tongue and the hard palate. The dorsum of the tongue is elevated against the hard and soft palate and the hyoid bone is raised from its position of rest.

When suction begins the tongue is withdrawn from the hard palate from before backwards and fluid is drawn up the straw into the space created, apposition between tongue and soft palate being maintained (*Fig. 3*). When a large quantity of barium emulsion is drawn into the mouth the mandible is lowered, thus creating more space between the superior surface of the tongue and the hard palate, and the forepart of the soft palate is drawn forwards to preserve palatoglossal closure (*Fig. 3 C*); the hyoid bone falls slightly. The barium contained in the mouth is swallowed in the usual manner, the hyoid being elevated and drawn forwards (*Fig. 3 E-H*).

If suction continues, the sequence of movements is repeated again and again. The second bolus begins to enter the mouth as the last of the first bolus passes through the fauces (*Fig. 3 G*). The mode of passage of each successive bolus through the pharynx is similar to that described in swallowing a large mouthful or in drinking. The hyoid bone remains forward and is not moved downwards while the mouth is being re-filled; it is moved backwards as the bolus is being passed from the mouth into the pharynx and is moved forwards again as the bolus passes out of the pharynx.

In some instances suction begins with the soft palate raised, the barium emulsion being drawn into the mouth by expansion of the chest. The amount taken in this manner depends upon the angle at which the head is held and is limited when the fluid reaches a level at which it can pour into the pharynx.

Drinking.—Drinking is usually performed in the following manner: The glass is raised to the mouth, is grasped by the lips, and tilted until the fluid level reaches the lips, the upper lip dipping beneath the fluid. The tongue fills

most of the mouth cavity proper, being apposed to the hard palate, the gums, and the teeth.

The first bolus is sucked into the mouth in a manner similar to that described in sucking through a straw. For swallowing to continue, the tilt of the glass must be increased to keep the fluid level at the lips; one bolus succeeds another without reconstitution of the airway until either the vessel is empty or the subject pauses. If the mouth of the vessel is narrow there may be difficulty in keeping the fluid level at the lips because the upper edge of the rim of the vessel comes in contact with the nose, in which case the head is tilted backwards so that the fluid may be poured from the glass into the forepart of the mouth.

Pouring.—The subjects examined were four normal adult males who all believed that they could empty a tankard of ale without a pause. They were given a glass of barium emulsion and asked to drink it quickly.

The glass is raised to the mouth and the first mouthfuls are taken by suction in the manner already described. The subject quickly extends the head and tilts the glass until the contents pour into the mouth.

Three of our subjects held the barium emulsion in the mouth by apposition of the soft palate with the tongue. When the mouth was full its contents were swallowed as a single bolus. Continuity of the flow of barium into the mouth was scarcely interrupted since further barium was taken into the forepart of the mouth as the first bolus was swallowed. The fourth subject swallowed the first bolus in the usual manner, refilling the mouth with barium emulsion as the first bolus was swallowed (*Fig. 4 A, B*). Then the tongue, hyoid bone, and larynx were lowered, apposition between the tongue and soft palate was lost and the barium flooded into the pharynx while still being poured into the mouth (*Fig. 4 C, D*); the tongue was moved forwards as the pharynx was distended and the epiglottis returned to the erect position (*Fig. 4 E*). The tongue was then arched towards the soft palate, momentarily reducing the flow of barium into the pharynx. The tongue was then drawn backwards and downwards and the larynx was moved backwards,

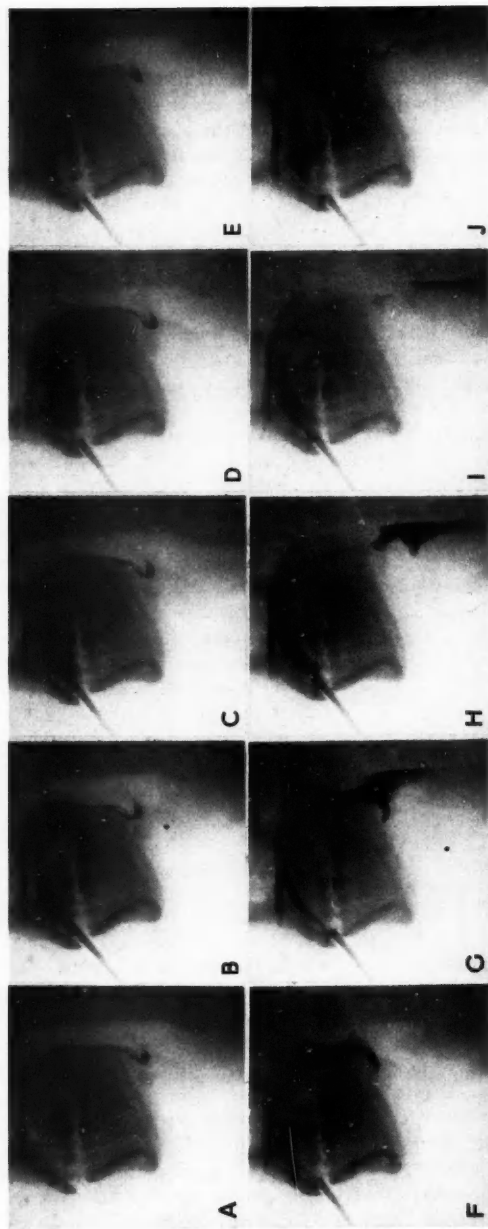


Fig. 3.—Sucking barium emulsion through a straw. Some barium has been run into the nose and outlines the upper surface of the palate. A, frame 1, Suction beginning; air being drawn up the straw. Palatoglossal seal. B, frame 28; and C, frame 41. Barium and air on the tongue. Palatoglossal seal maintained. Nasopharyngeal airway open. Suction is created by progressive lowering of the forepart of the tongue from the hard palate. D, frame 59. Beginning of swallowing. The tip of the tongue raised to the upper incisor teeth. E, frame 62; and F, frame 65. Squeezing of the bolus backwards; nasopharyngeal closure. G, frame 67; H, frame 72; and I, frame 75. Entry of second bolus while first bolus is being swallowed. J, frame 90. Beginning of second swallowing act. Nasopharynx closed (compare with D).

reducing but not obliterating the lumen of the pharynx and assisting the movement of the barium into the œsophagus; the epiglottis

moved forwards, the dimensions of the pharynx being again increased (*Fig. 4 H*). The sequence of movements was repeated again and again

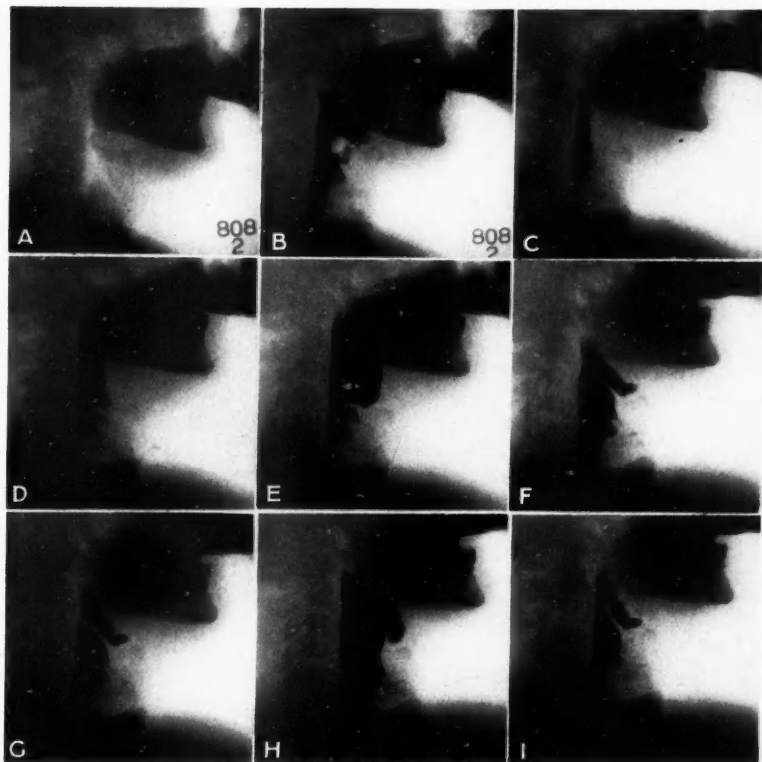


Fig. 4.—Pouring liquid into the mouth.

- A, frame 14. The first bolus taken by suction.
 B, frame 24. First bolus is cut off and swallowed in the usual manner.
 C, frame 33; D, frame 35; E, frame 38. Progressive elevation of the glass, the contents being poured first into the mouth and then into the pharynx. Depression of the hyoid bone and larynx. Elevation of the previously downturned tongue of the epiglottis. The tongue is drawn forwards to increase the capacity of the pharynx.
 F, frame 46. Tongue elevated to cut off the second bolus and moved backwards to aid in displacement of the bolus from the pharynx. Tongue of the epiglottis is erect. Trace of barium in laryngeal ventricle and vestibule. The third bolus is being poured into the mouth.
 G, frame 48. The tongue and larynx are drawn backwards but pharyngeal clearance is defective.
 H, frame 62. Third bolus distending pharynx while the fourth bolus is poured into the mouth. More barium has entered the laryngeal vestibule.
 I, frame 68. Tongue and larynx drawn backwards to displace fourth bolus (compare with G) while the fifth fills the mouth. Most of the barium has been expressed from the laryngeal vestibule.

remained erect and there was no significant forward movement of the posterior pharyngeal wall (*Fig. 4 F, G*). The tongue was then drawn downwards and forwards and the larynx was

until the glass was emptied, the final bolus being swallowed in the usual manner, the larynx rising and the tongue of the epiglottis being turned down (*Ardran and Kemp, 1954*).

Taking Paste from a Spoon.—Each subject was given a spoonful of barium paste.

Barium paste may be taken into the mouth by suction, pouring, or dropping, or by scraping the paste from the spoon as it is withdrawn from the mouth through the apposed teeth and lips. The usual method is as follows: The spoon is inserted into the mouth and the lips closed upon it. As the spoon is withdrawn from the mouth its contents are left behind in the forepart of the mouth upon a groove in the tongue. Part, or the whole, is then elevated upon the tongue to the roof of the mouth and swallowed in the manner already described.

Swallowing of Solid Lumps.—Different subjects were given hard chip potatoes, small pieces of apple, and barium-filled capsules, with or without additional barium paste or water. The subjects were asked to position the contents of the mouth in preparation for swallowing.

If the lump is dry many subjects have difficulty in swallowing, but there are some who can swallow small fragments comparatively easily. The method of swallowing is usually similar to that observed on swallowing fluid or paste, but sometimes, especially if the lump is small, the procedure is slightly modified. The soft palate is not elevated towards the posterior pharyngeal wall in the normal manner and is only parted from the tongue as the latter squeezes the bolus backwards.

Individual Variations.—In writing the above account we have endeavoured to distinguish between those movements essential for performing the action under review and other associated movements. The general pattern of each movement is constant but there are many variations in individual behaviour when taking and swallowing food. This is partly due to variations in the size, shape, and consistency of the food, the subject's like or dislike of these substances, the shape of his mouth, and his eating habits. An individual may begin to drink from a cup by sucking with his chest, change to suction with his tongue, and conclude by pouring; the degree to which these three methods are used varies.

Swallowing fluids in the erect position is facilitated by gravity. In other positions the

influence of gravity may modify the distribution of fluid boluses at different phases of the act of swallowing and necessitate greater muscular effort, but no fundamental differences in the pattern of the tongue movements in different positions have been observed.

DISCUSSION

The description of swallowing given in most text-books suggests that the bolus is thrown or squirted back into the pharynx. Lerche (1950) quotes Schreiber (1904), who produced a diagram showing the forepart of the tongue turned upwards and backwards to project the bolus into the pharynx. Whillis (1946) observed the behaviour of a man who had a large gap in his cheek. He distinguished two phases in the action of the tongue; in the first the tongue acted as a squirt transferring fluid from the front to the back of the mouth; in the second the mylohyoid muscles came into action and forced the fluid from the oral into the laryngeal part of the pharynx. In swallowing a solid bolus he considered that only the second phase occurred, except when the mouth is cleared of saliva and debris, after the bolus had been swallowed. Schreiber (1904) and Whillis (1946) imply that the bolus is projected into the air-filled pharynx.

Little has been written on this subject by radiologists. The most important contribution was made by MacMillan, who took a series of still radiographs of himself swallowing barium emulsion.* Five of this series, arranged to show the movements in correct sequence, form part of a paper by Mosher (1927).

Cineradiographic films, taken with modern X-ray equipment, have made it possible to study the swallowing movements in greater detail. In our preliminary communication we described how the bolus is expressed into the pharynx by a squeezing action of the tongue against the palate, taking place from before backwards (Ardran and Kemp, 1951). A similar description has been given by Rushmer and Hendron (1951) and by Ramsey (1953). The present paper confirms and amplifies these statements.

Barclay (1936) claimed that the pharynx was always closed a fraction of a second before

the swallow and that the movement of the bolus through the pharynx was due to suction created by reopening the pharynx with the nasal and laryngeal passages closed. Barclay's views have been strongly refuted by Negus (1948), who measured positive pressures in the pharynx during the passage of a bolus in a patient who had a lateral pharyngeal stoma, and by Rushmer and Hendron (1951), who recorded positive pressures in the pharynx during the passage of the bolus in normal subjects. Our cineradiographic records lend no support to Barclay's statement that a negative pressure plays a significant part in the swallowing of a liquid or solid bolus. In most normal subjects the bolus descends into the pharynx while it still contains air and while the larynx is still open. It has also been observed that the transit of the bolus through the pharynx may occur quite normally in subjects in whom nasopharyngeal closure is defective. The expression of the bolus from the mouth by apposition of the tongue against the palate is normally continued in the pharynx by apposition of the tongue and the pharyngeal constrictors; the wave of contraction of the pharyngeal constrictors takes place from above downwards. It is clear how Barclay came to put forward his theory. He examined his subjects by fluoroscopy while they were drinking and observed the obliteration of the pharyngeal lumen as each bolus was stripped from the pharynx. From this observation he concluded that for swallowing it was necessary to obliterate the pharyngeal lumen so that by its reopening the bolus would be sucked in. He failed to observe that this phenomenon did not occur when swallowing a single bolus. Air is sucked into the pharynx, in the manner described by Barclay, upon the reinflation of the airways, proving that at this phase there is negative pressure in the pharynx.

In the normal individual the bulk of the bolus is normally swallowed in the midline over the dorsum of the tongue. Spill along the sides of the tongue may be seen on pouring fluid into the mouth or throat or in individuals who have some abnormality. Whillis's patient (1946) was able to pass his food entirely on the side of the tongue, opposite to the operative

defect. We have examined three similar patients; they all tended to displace the bolus in the same manner. A similar pattern of movements may be seen in patients with a cleft-palate defect who sometimes pass the bolus on both sides of the tongue and in some patients with neuromuscular disorders (Ardran and Kemp, to be published).

Many writers fail to distinguish between the movements of swallowing and those necessary for taking food into the mouth. Auerbach (1888) clearly recognized the importance of suction in drinking, and that there were two methods of suction, with the tongue and with the chest. He measured the negative pressures created. Rushmer and Hendron (1951) give a clear account of the action of the tongue in sucking fluid into the mouth. A clinical distinction between suction and suckling has been given by Gwynne-Evans (1951).

SUMMARY

A description is given of the action of the tongue in taking food into the mouth and in deglutition, based on a study of cineradiographic films taken of 250 normal young adults.

Acknowledgements.—We are indebted to the numerous volunteers who have consented to be examined; and to Professor T. Pomfret Kilner, Mr. Ronald Macbeth, Mr. Gavin Livingstone, and other clinical colleagues for permission to examine a number of their patients.

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DISCUSSION

Mr. E. Gwynne-Evans, opening the discussion, said that about two years ago he and Professor Whillis paid a visit to Oxford, where they spent a happy day with Ardran and Kemp viewing many cineradiographic records of feeding and swallowing behaviour in slow motion. Their technique of cine-analysis had been brought to a high and finite level. He said "finite" because movements of muscles and structures could be analysed frame by frame and there was no doubt of what was seen. The interpretation might be open to discussion, however, for only through viewing these films over and over again could they say which movements were important and which irrelevant, which could be ignored and which were of significance. In time, typical and atypical patterns of movement became familiar. The danger lay in seeing movements not as they were, but as one expected them to be.

For instance, in suckling behaviour they would adduce from clinical observations and from the studies of Negus that milk passed in an intermittent stream on either side of the upraised margins of the epiglottis, without closure of the glottis or elevation of the soft palate. A film of suckling behaviour taken by Russell Reynolds a few years ago showed the soft palate being actively tensed against the tongue, and Mr. Gwynne-Evans then had no doubt of the open glottis and the continuation of breathing. Films taken by Ardran and Kemp, however, had revealed the unexpected, in that milk might accumulate in the mouth to form a liquid bolus, which was then swallowed with glottic closure and elevation of the soft palate. It might well be that both methods of transferring milk from the mouth to the pharynx existed in life.

Professor Last, in a paper to the Royal Society of Medicine, had already referred to the danger of speculative reasoning and deduction of armchair anatomy. Even clinical observation was beset with dangers if that observation were made in unnatural circumstances. For instance, Ardran and Kemp had pointed out in their writings that laryngoscopy, even with the laryngeal mirror, might give a false interpretation of the movements of the vocal cords in respiration, because the mouth was widely open and the tongue was held forward. To his mind, therefore, cineradiography of orofacial, pharyngeal, and laryngeal movements in breathing, feeding, and swallowing behaviour was of the greatest value, not so much because such movements were normally hidden from view or were too rapid to discern even when they could be viewed as the result of operative measures which included removal of the cheek and part of the jaw or maxilla, but because such movements could be recorded in their natural environment.

Their interest was in the action of the tongue, facial muscles, and lips in the control and transportation of the liquid or semi-soft bolus. Observations on the behaviour of the orofacial muscles from infancy to adolescence had been recorded on slow motion cine-film by Rix, Ballard, Tulley, Mr. Gwynne-Evans himself, and others; Tulley was recording patterns of action potentials from the contractions of the muscles by means of the electromyograph; Anderson had recorded electrically pressure forces between the occluding teeth in chewing and in swallowing; this evening, they were benefiting from the experience of cineradiography.

Much research had been conducted into the neurophysiology of muscle patterning, into the evolutionary history of feeding behaviour, and into the comparative

anatomy of the masticatory mechanism. Only when all aspects of the problems before them had been correlated would the truth be known.

He was rapidly becoming an old "boffin", and old boffins were inclined to reminisce. His duty was to open the discussion and he would refrain from saying more. He congratulated the authors on their patience and on the meticulous care with which they had made their records. He ended with a question which he realized might be difficult, if not impossible, to answer at this stage of their investigations. Had any variation been noticed in the direction of the upward and forward thrust of the foremost part of the tongue when swallowing commenced? Might the tongue be pressed against the lingual surface of the upper incisor teeth or might it even pass between the upper and lower incisor teeth in some cases? Was the pressure of the tongue always due to an act of the tongue itself or might it be due to the contraction of the mylohyoid and be in the nature of a spread rather than an active thrust?

Mr. Rix said he had seen stills from the films before. They were fascinating, and the authors were to be congratulated on their superb technique. Was the viscosity of the barium the same throughout all the illustrations or was it, in some of the examples, given in a more viscous state than could be described as "fluid"? Had the authors any films of the swallowing of people with obvious speech defects? Had they noticed any peculiarities in the behaviour of the tongue in swallowing with such people? As orthodontists, they were apt to be frightened of speech defects.

The illustrations seemed to show beyond doubt that in bottle feeding the gum pads of the infant were not brought together. There seemed to be no apposition of gum pads at any time.

Miss Clinch said that it seemed from many of the films that the teeth were not brought into apposition when swallowing. Was this so? And was pressure exerted by the cheeks during swallowing?

Mr. Howell asked the authors whether they had made any observations of the part played by swallowing in post-nasal drainage. In relation to atypical swallowing actions, had they noticed any association with inadequate post-nasal drainage and nasal pharyngeal closure? The point made by Mr. Rix about lack of apposition of the gum pads was important. Had the authors seen any evidence of the tongue being protruded between the lower jaw and the base of the nipple during the suckling action? Without intending to be irreverent, he wanted to know whether the authors had taken any photographs of patients swallowing while standing on their heads.

Dr. Kemp, in reply, said they had taken photographs of people lying on their faces, on their backs, on the right and left laterals, and upside down.

The question on post-nasal drainage was extremely interesting. They had gone into it in connexion with a paper they were preparing on the palate, but they had been disappointed with their experiments. They had been interested in the clearance of the mucus and the barium from the back of the nose; gravity helped, of course, but it was remarkable how inefficient swallowing was from the point of view of clearing that material away. He referred to the Rosenmuller fossa and said the clearance was very defective.

He agreed that in many of the films the teeth were not tightly in apposition, but the combined action of teeth, cheek, and tongue was at least enough to stop the barium from being squirted into the cheek cavity during

the swallowing. They had not considered the problem at all fully.

They had noticed that the gum pads were not in apposition, but they had only just begun the examination of very young children and would hesitate to go into the question in detail at present.

The only speech defect in children so far explored was defective nasopharyngeal closure—speech with a nasal escape, such as they saw in relation to the submucous cleft of the palate and various cleft-palate abnormalities. They had investigated the act of swallowing in those people, as well as the action of closure of the soft palate, and they had found that swallowing in such people was frequently abnormal.

Barium had been used when mixed with all kinds of foodstuffs, but the viscosity of the material used had not been measured. Barium milk, barium porridge, barium mixed with potato mash, and all kinds of thickness of barium itself had been used, as well as barium mixed with solid foodstuffs. They had not gone into the matter to great depth, beyond establishing the fact that viscosity was a factor in swallowing. Gravity was an important influence in swallowing and the viscosity of

the material being swallowed was very important. The more gluey the material was, the more it stuck.

Mr. Gwynne-Evans had asked about abnormal swallowing patterns, but beyond the fact that he was quite certain that they occurred, Dr. Kemp said he could give no information as he had not yet gone into the subject. The authors had read with interest the papers on these activities which Mr. Gwynne-Evans had mentioned, but had not so far taken up the work. They recognized their limitations; they had to deal with one small part of the work at a time.

Mr. Gwynne-Evans had asked whether the tongue apposition to the soft palate was active or passive. The authors acknowledged that they did not know. The tongue was apposed to the hard palate from before backwards. The tongue was spread—there was no question about that. How did it spread? By something intrinsic in the tongue or by the mylohyoid muscles? The authors had done no work to supply the answer. They knew that the tongue went between the teeth in certain acts of swallowing, but they had not deliberately studied the normal swallowing actions of children as yet. That was work still to be done.

BOOK REVIEWS

FIXED PARTIAL PROSTHESIS. By JOSEPH E. EWING, D.D.S., F.A.C.D., Professor of Crown and Bridge Prosthesis, Temple University School of Dentistry, Philadelphia, Penn. 7 × 10 in. Pp. 208. Illustrated. 1954. London: Henry Kimpton. 45s.

It is common practice among dental authors to write comprehensive text-books about their specialties regardless of whether large sections have been adequately and probably better covered elsewhere. Surely it would be sufficient to indicate the authoritative texts the reader should turn to for information and proceed to write the chapters that the author feels are his contribution to dental literature.

Dr. Ewing, in this new book on bridgework, has not fallen into this trap. His purpose, as he states in the preface, is to present some simple and practical techniques for students and general practitioners. These are clinical procedures which have been well tried over a number of years, under a variety of conditions, and in most cases are the simplest and easiest way. He has succeeded admirably in describing the majority of crown preparations that are usually met with in practice, as well as methods of impression taking, pontic making, insertion and removal of bridges, and the associated laboratory procedures. Considering

the size of this small book very little that is important has been left out, though several aspects may have been rather hastily covered. Undoubtedly one of the most useful chapters is the last, on case design, describing very clearly the abutments necessary for bridges in any part of the mouth.

The author states that this book is specifically for senior students and practitioners. It is, in fact, a chairside manual for the beginner and has, one imagines, been developed from the notes that he uses in teaching his students the elements of Crown and Bridgework. Nevertheless, most readers will find many useful tips.

When this volume goes into its second edition it is hoped that Dr. Ewing will clarify some of the smaller drawings and persuade the publishers to use a lay-out artist in presenting the material. For instance, on pages 70 and 92 the drawings have been squashed to the top of the page leaving a large blank space below, while elsewhere so much has been squeezed on to a page that sketches and text become a complete jumble.

It is surprising to find that the only type of inlay abutment described is the Knapp slice-lock type, which nowadays is in disfavour due to its rather poor retention and liability to

recurrent caries. Again, no mention is made of the new elastic rubber impression materials. Finally to British and Continental readers, the text may, at times, present difficulties because of the American numbering of the burs and stones and the advocacy of the use of various unobtainable trade products. However, equivalents are available which will give much the same result.

Despite these criticisms this reviewer has no hesitation in recommending Dr. Ewing's book as a valuable addition to any dentist's books of reference.

D. D.

DENTAL AND ORAL X-RAY DIAGNOSIS.

By A. C. W. HUTCHINSON, D.D.S., M.D.S., F.D.S., F.R.S.E., Professor of Dental Surgery, University of Edinburgh. With a Foreword by Sir Sidney Smith, C.B.E. 9½ × 6½ in. Pp. 24 + xii, with 946 illustrations. Edinburgh: E. & S. Livingstone Ltd. 75s.

PROFESSOR HUTCHINSON has attempted in this book to correlate the aetiology, pathology, and clinical features of the conditions with which he deals and to describe their radiographical appearances. Each subject is therefore treated under these subheadings.

In some instances the radiographical changes that can be detected are of orientation or position of a tooth and in others our lack of knowledge of the morbid processes responsible for radiographic appearances is such that there is little to be said beyond a bare statement of fact. This being so, in a number of chapters the radiological portion forms only a small proportion of the text and thus in some ways this book differs little from a shortened version of the traditional type of text-book of dental surgery and pathology though illustrated exclusively with radiographs. The popularity of this book with undergraduates and post-graduates who are studying for examinations may be limited by the fact that more detailed and just as readable accounts of the aetiology and clinical features of oral diseases are already available to them. A text-book dealing with radiology must to a large extent stand or fall on the quality of its illustrations, the reproduction of which is fraught with much

difficulty. Many will probably consider that the illustrations of radiographs with which this book is so richly endowed are ample return for their investment and both authors and publishers are to be complimented on presenting this wide selection of radiographs so carefully chosen and so uniformly reproduced.

Some of the opinions expressed in this book are not accepted by all clinicians, for example: "—both (rodent ulcers and adamantinomas) appear to be radio-sensitive." Also the view that radiographically with adamantinomas there is no evidence of new bone formation, which is contrasted with fibrous dysplasia where there may be a certain amount of sclerosis of the bony margins, conflicts with the view expressed by Sonesson.

Most radiologists would say that the lesion illustrated in *Fig. 432* presents many of the classical features of an adamantinoma and to refer to it as a "dentigerous cyst" seems likely to confuse the student.

The terms "spongy" and "amorphous" varieties of bone used in the pathology section of osteitis deformans could do with amplification as they have no generally recognized histological meaning. Students find the "osteodystrophies" difficult and the term "leontiasis ossea" particularly confusing. It should be made clear that leontiasis ossea is not now regarded as a disease entity, but may be employed as a term of value for descriptive purposes until the correct diagnosis of a case can be established.

These are, however, details and there is no doubt that this book supplies a need, for there are few books which have been written on this subject in Great Britain.

This book can certainly be recommended to general dental practitioners, who will find it a useful means of refreshing their knowledge of oral pathology as well as expanding their knowledge of dental radiology. It will also be of particular value to general radiologists who occasionally have to express an opinion on oral lesions. Dental graduate students should find the chapters on fractures, diseases of the maxillary sinus, developmental anomalies, and diseases of the salivary glands especially worthy of their attention.

G. R. S.

CRITICS' CORNER

(Under this heading we print letters which discuss points arising from articles which have appeared in the DENTAL PRACTITIONER.)

To the Editor.

Sir,

In spite of the increased potency of local anæsthetic solutions there is still a place for the intra-osseous injection. It is immediate and certain; obtrusive facial and tongue effects are almost eliminated and, with weak solutions, a selection of the duration of anæsthesia is possible. It may be a minor point, but anæsthesia lasting long beyond the operating period is undesirable both physiologically and from the patient's angle. A mandibular injection, for instance, is a lot of anæsthesia for sensitive, though otherwise short, cavity preparations in the lower jaw.

A brief clinical note on the use of two weaker lignocaine solutions (1 per cent $\frac{1}{100000}$ E and 0.75 per cent $\frac{1}{120000}$ E) by the intra-osseous route may be of interest. Some 300 injections were made, nearly all for conservation. Notes were taken at injection and patient's subsequent reports (P.C. questionnaire) subsequently assessed. About 70 per cent returned the cards and these were illuminating. Up till this time the writer had tended to assume that if nothing was heard from a patient there had been no after-effects, but this idea had to be revised.

Consideration of the replies, however, showed that there was a significant diminution in the incidence of after-discomfort the weaker the solution. This was particularly marked where a number of injections were made, for comparison, with the standard 2 per cent $\frac{1}{80000}$ E solution. This latter strength is very seldom necessary by intra-osseous injection. The 0.75 per cent solution was used in this way in 200 cases, and by varying the amounts from $\frac{1}{3}$ c.c. to 1 c.c. anæsthesia could be proportionately varied from a few minutes to three-quarters of an hour. If necessary it can be re-established at once through the preliminary needle path. The great majority of the 0.75 per cent injections were free of after-effects. The 1 per cent solution was used

similarly: for long-rooted canines, or where it was more convenient to inject mesially to the tooth in the lower jaw, amounts were increased. Other causes of pulp irritation were fairly constant, the drill being used under H₂O or air stream. Provided injections were made very slowly there were no apparent systemic effects. There is a constant tendency to speed up injections. A number were deliberately injected fairly rapidly to see if liberties could be taken with weak solutions, but in three of these cases mild effects were observed similar to the old procaine and heavily concentrated adrenaline mixtures. It is advisable also to inform the patient that injections are being made slowly, otherwise they may be tensed during this period.

The combination of weaker solutions can be useful, e.g., in apicectomies involving the removal of a burrowing abscess sac, which is sometimes not reached by infiltration, a submucous 1 per cent injection is supplemented by a 0.75 per cent intra-osseous just before resection of the apex. This is also useful occasionally in those teeth with a degree of pulp hyperæmia or periodontitis which are impossible to anæsthetize by infiltration or nerve-block, though after-effects could be expected in such cases.

There seems to be an advantage in having a choice of different strengths of solution for different conditions and types of operation. The ones described are suggestions.

Yours sincerely,
K. McALLISTER

4, Saxby Street,
Leicester.

ERRATUM

March, 1955, 5, No. 7, p. 233, bottom line of first column, for Stanton, of New York (1951) read Stanton, of New York (1915).

SOCIETY NOTES

**INSTITUTE OF BRITISH SURGICAL
TECHNICIANS (INC.)
(Dental Section)**

Dr. W. R. Tyldesley, Ph.D., M.Sc., gave a lecture on the Practical Application of Mechanical Testing of Materials at the Turner Dental School Manchester on Friday, January 21, 1955.

In his opening remarks the lecturer mentioned the tests with which he hoped to deal and indicated that the value of any test was limited to the particular property under review, whilst in practice the materials are usually subject to complicated stresses. Mentioning the Comet disasters as proof of this, Dr. Tyldesley made it clear that the final test for any dental material must be a clinical test.

Commencing with the tensile test, he systematically dealt with the information obtained by plotting a curve and how the values of proportional limit, yield point, and ultimate tensile strength are used in determining the working and wearing properties of metallic alloys. The application of Young's modulus, particularly with regard to alloys used for clasps, was stressed. Dr. Tyldesley emphasized the part played by heat treatment on the structure of alloys and how crystal size affected the properties, illustrating his remarks with some fine specimens to prove the hardness and brittleness when the grains are large, and the flexibility when the grains are small.

In estimating the usefulness of the compression test, the lecturer demonstrated the difference in behaviour of various substances, showing that copper, which is ductile, will 'flow' under pressure, whilst plaster will collapse through 'shear'. The application of this test is therefore limited, but it is particularly useful in assessing the qualities of amalgam because of the conditions to which this material is subject.

The bench test in which the specimen is fixed at each end and the load applied in the centre, was criticized as being unsatisfactory because of the complicating conditions of tension on the lower surface and compression on the upper surface of the specimen which produce shear strain near to the points of fixation. Dr. Tyldesley suggested that better results are obtained if the load is applied at either end of the specimen.

In comparing this group of tests it was pointed out that dental materials are subject to the complicated stresses of "push, pull, and shear" when in the mouth. Therefore the tensile test gives the nearest loading to these conditions, but it cannot displace the clinical test.

The property of hardness, which is so difficult to define, was the next to be discussed. After describing the various ball and diamond machines used in this test, Dr. Tyldesley pointed out the difficulties of getting comparable readings of different substances because of the variations in the amount of plastic flow. The Scheroscope (or bouncing ball) machine came in for severe criticism because, whilst it is true that the steel ball will bounce higher from hard steel than from lead, rubber would probably give the highest reading of all.

Similar difficulties are met in the abrasion test where it is found that some of the softer materials are more resistant to an abrasive force than the harder ones. In the opinion of the lecturer such a test may have some value as a measure of the strength and workability of metals.

The impact test is seldom used for dental materials because of its duplication of the tensile test.

In summarizing his remarks Dr. Tyldesley described in some detail the problems associated with fatigue, noting that dental appliances are subject to a condition of repeated small stresses from which this condition arises. With the aid of graphs he showed the process of strain and recovery and the determination of a theoretical safe load which may be applied repeatedly and from which the material makes a repeated recovery.

Corrosion and its effect on the fatigue life of a material was given special mention. Structures subject to repeated small loads, whilst under a salt spray, have a shorter life than when the spray is absent. Dr. Tyldesley reminded his audience that mouth fluids are comparable to a salt spray.

The inaugural Lecture for the Birmingham area will be given by Professor J. Osborne, M.D.S., Ph.D. (Sheffield), F.D.S., of the Birmingham University, on Friday, April 22, 1955, at 7.0 p.m. in Colmore Room, Grand Hotel, Colmore Row, Birmingham. Admission tickets are obtainable on sending a stamped addressed envelope to Mr. H. J. Harcourt, L.I.B.S.T., 8 Hillside Road, Erdington, Birmingham 23.

CONTINENTAL DENTAL SOCIETY

Friday, April 22, 1955

"AT HOMES"

Mr. H. H. Hirst: "Approaches to full denture stability at the chairside." This demonstration will take place by courtesy of Mr. G. Stock at 8, Vale Close, Maida Vale, W.9. Tel. CU'Ntingham 8503. Two sessions at 2.30 and 4 p.m.

Mr. F. Robert Munz: "Adhesion impression technique." By courtesy of Mr. M. Meyer at 45, Arkwright Road, Finchley Road, N.W.3. Tel. HAMpstead 9271. Two sessions at 2 p.m. and 4 p.m.

Mr. Arnold Rosenstrauch: "Construction of post crown by direct technique." By courtesy of Mr. John Ellinger at 117, Berkeley Court, Baker Street, N.W.1. Tel. WELbeck 5179. One session at 2 p.m.

Mr. L. H. Schuler: "Gingivectomy by electro-surgery." At 5, Strathearn Place, Hyde Park Square, W.2. Tel. AMBassador 2883. Two sessions at 2 p.m. and 4 p.m.

Admission by ticket only on application to Mr. W. Reif, 75, Wimpole Street, W.1. Tel. WELbeck 3242.

Saturday, April 23, 1955

Eastman Dental Hospital, Gray's Inn Road, W.C.1. 10 a.m. Dr. Robert Gosling: "Psychosomatic medicine and dentistry."

Dr. Ch. F. L. Nord (Amsterdam): "The future of dentistry from an international point of view."

LUNCH INTERVAL

2.15 p.m. Mr. Ronald J. G. Grewcock: "Occlusal trauma, its cause, effect, and treatment."

Short Papers:—

Mr. M. M. Adler: "On using apicoflux."

Mr. Eric K. Joseph: "Carcinoma of the maxillary antrum."

Mr. H. D. Norton: "Premedication in dental practice."

Mr. F. G. Salomon: "Periodontal derangement through emotional disturbance."

Mr. F. B. Strauss: "Increased speed of dental engines."

Members of the profession welcome.

7 p.m. for 7.30 p.m.: Reception and dinner-dance, Cumberland Hotel, Marble Arch, W.1.

Tickets 30s., excluding drinks and gratuities, available by postal application: from Mr. W. Reif, 75, Wimpole Street, W.1. Guests may be introduced by a member of the Society. Cheques payable to "Continental Dental Society" should be sent with application.

Sunday, April 24, 1955

Cora Hotel, Upper Woburn Place, W.C.1. Tel. EUSton 5111.

10 a.m. (sharp). Mr. M. Walter: "Improved methods in periodontal treatment."

Members of the profession welcome.

10.50 a.m. Mr. H. J. Turkheim: "Progress Report," a survey of advances in international science and practice (for society members and guests), followed, after a short interval, by the Annual General Meeting, 1955 (for members of the Society only).

Dental Caries in Young Children

This survey is concerned with the incidence of dental caries in children under the age of 5 years taken over a period of four years. The children were attending various day nurseries in the City of Liverpool. By confining the

ABSTRACTS

from Other Journals

investigation to children under 5, the complications of the mixed dentition were avoided. A total of nearly two thousand children were examined. The results are presented in age groups and show that the percentage of caries-free children is similar for all age groups. A drop in this percentage in 1949 was followed by a rise in 1951. The susceptibility of individual teeth varies, but there is a steady rise in the susceptibility of all teeth with increasing age. It is interesting to note that the fall in the percentage of caries-free children revealed at the examination made in May, 1949, took place two to three weeks after the derationing of sweets.

The author concludes that within the foreseeable future there is no likelihood of being able to deal with the problem on a reparative basis, and suggests that two preventive measures would assist greatly in reducing the caries incidence, the first being the fluoridation of public water supplies and the second the plain-water mouth rinse after eating. Of primary importance is the need for the education in dental health of all who have children under their care.—"Incidence of

Dental Caries in Children under 5 Years Old". SLACK, GEOFFREY L. (1955), *Brit. med. J.*, 1, 260.

Surgical Treatment of Oral Cancer

There are conflicting claims of radiotherapy and surgery in the treatment of oral cancer. The radiotherapist has come to recognize several groups of patients who seem to react unfavourably to radiation, and these continue, for the most part, to find their way to the surgeon for treatment. The case is thus considered suitable only for surgery under the following circumstances:—

1. When there is involvement of the bone.
2. When there is failure to respond to irradiation.
3. When the tissue in the area to be treated is known from experience to be intolerant of the dose of radiotherapy required for the cure.
4. When there is a recurrence in an area which has already been heavily irradiated, and where further therapy is fraught with the risk of tissue necrosis.

However, there has been a revival of interest in the surgical management of oral cancer without previous radiotherapy treatment, but before a surgeon treats cancer of the mouth by surgery, there are certain questions which he must put to himself and to each of which he must find a proper answer.

Is he sure that it is cancer? Early diagnosis is important and therefore biopsy should be made, even if the biopsy has to be repeated several times. Biopsy is required, not only to establish the diagnosis, but for the study of its cellular characters, and for this again a generous biopsy is necessary.

Is the cancer accessible? Generally speaking, there is no tumour in the mouth to which

one cannot gain access by suitable division of the soft tissues and bone.

Can one eradicate the tumour? The answer will depend on three factors: extent of the tumour; rate of growth and spread; and the experience, enthusiasm, and good judgement of the surgeon.

Is the patient likely to survive the operation? It is unusual to get any immediate death.

Will the post-operative morbidity be excessive? Slow healing, necrosis of wound edges, wound disruption, and fistula formation may all be encountered, especially when there has been previous heavy irradiation.

What prospect is there of cure? There are few published results; so one must, for the most part, be guided by one's own experience.

What of the functional result? This question is intimately bound up with the problems of repair and reconstruction.

The need for careful mouth hygiene and the value of mechanical cleansing cannot be emphasized too much. If the teeth are obviously carious and their removal does not constitute too formidable a task, it is better to see they are extracted, even if it means delaying the operation for a few days. The presence of teeth is certainly a nuisance when it comes to repairing the mucous lining of the mouth. It is, however, unwise to disturb any teeth in the jaw which has been irradiated unless it is intended to remove the bone itself as well.—EWING, M. R. (1954), *Brit. J. plastic Surg.*, 7, 108.

RECRUITS TO DENTISTRY

Members of Interdepartmental Committee

The Ministry of Health announced in a written answer in the House of Commons on Friday, April 1, the names of the members of the Interdepartmental Committee which the Secretary of State for Scotland and he are setting up to inquire into the shortage of recruits to the dental profession. The Terms of Reference which have been given to the Committee are: "To ascertain the reasons for the lack of candidates of suitable calibre for training as dentists and to indicate possible directions in which remedies might be sought."

Sir Arnold McNair, C.B.E., Q.C., F.B.A., LL.D. (as already announced) has been appointed as Chairman. Sir Arnold has recently retired from membership of the Permanent Court of Arbitration at The Hague, where until February this year he was British member. Previously he was Vice-Chancellor of Liverpool University, and in 1942 was Chairman of the Committee on the Supply and Training of Teachers and Youth Leaders. He now lives near Cambridge and is a Fellow of Gonville and Caius College.

The Committee consists of ten members in addition to the Chairman, five of them dentists and five not connected with the profession. The members who are dentists have been suggested by the British Dental Association, the Dental Board of the United Kingdom, and the Dental Education Advisory Council, together with the Royal College of Surgeons of England, the Royal College of Surgeons of Edinburgh, and the Royal Faculty of Physicians and Surgeons of Glasgow. The British Dental Association have put forward:—

J. E. H. Duckworth, Esq., M.C., L.D.S. R.C.S. (Eng.), of Hendon, London.

J. L. Trainer, Esq., L.D.S. R.C.S. (Edin.), L.R.C.P. (Edin.), L.R.C.S. (Edin.), L.R.F.P. and S. (Glas.), of Kelso.

R. O. Walker, Esq., L.D.S., H.D.D. (Edin.), F.D.S.R.C.S. (Eng.), L.R.C.P. (Edin.), L.R.C.S. (Edin.), L.R.F.P. and S. (Glas.), of Birmingham.

The Dental Board have put forward their Chairman, Sir Wilfred Fish, C.B.E., M.D., Ch.B., D.D.Sc., D.Sc., F.D.S. R.C.S. (Eng.). Sir Wilfred practises in London.

The authorities concerned with dental education have put forward Professor F. C. Wilkinson, M.D., Ch.B., B.D.S., D.D.Sc., M.Sc., F.D.S.R.C.S. (Eng.). Professor Wilkinson is Dean and Director of Studies of the Institute of Dental Surgery in the British Postgraduate Federation of the University of London and Director of the Eastman Dental Hospital.

The lay members are as follows:—

G. E. Gittins, Esq., M.A., Director of Education in the County of Monmouth.

I. D. McIntosh, Esq., M.A., Headmaster of George Watson's Boys' College, Edinburgh.

G. R. Moxon, Esq., Adviser on Personnel Management to the National Employers' Association of Rayon Yarn Producers, in Manchester. Previously he was Director of the Institute of Personnel Management.

Mrs. Mary Stocks, B.Sc., who is well-known as a broadcaster. Mrs. Stocks lives in London and is a member of the University Grants Committee. From 1939 to 1951, she was Principal of Westfield College. She is a member of the London Executive Council.

Professor A. P. Thomson, M.C., M.D., F.R.C.P., Professor of Therapeutics in Birmingham University, Dean of Birmingham Medical School.

The Secretary of the Committee is Mr. T. C. L. Nicole, of the Ministry of Health.

The Committee hope to hold their first meeting very shortly and will issue a notice, as soon as they are ready, inviting the submission of evidence.

THE PROCEEDINGS OF THE BRITISH SOCIETY OF PERIODONTOLOGY

President: F. E. HOPPER, B.D.S., F.D.S. R.C.S.

Hon. Secretary: A. BRYAN WADE, B.Ch.D., F.D.S. R.C.S.,
The Royal Dental Hospital, Leicester Square, London, W.C.2

Vol. V, No. 3

April, 1955

DENTAL HEALTH EDUCATION IN THE UNITED STATES OF AMERICA

By A. E. PARROTT, L.D.S. R.C.S.

(Gibbs Travelling Scholar, 1954)

YOUR scholarship committee saw fit to pluck a general practitioner from a decent obscurity in the Middle West, and dispatch him on a round trip of some 10,000 miles to study the ways in which the United States of America furthers the dental health education of its citizens. You will therefore accept as inevitable the lack of academic finesse that this paper will reveal. The objective and analytical approach of the specialist and research worker, which a learned society expects of its contributors, will give place to a series of observations made through the jaundiced eyes of a harassed provincial practitioner. One who perforce spends much of his time trying to persuade patients that it would be to their advantage to visit him between bouts of toothache, that carious deciduous teeth are worth saving, that pyorrhœa can be treated with other instruments than forceps, and that all this and similar advice is, if not wholly altruistic, at least identifying the patients' interests with the dentists' and not directed wholly towards the enrichment of the latter. The dentist in closest contact with the general public is the general practitioner, and much of the public's lamentable ignorance of dental matters is due to the dentist's inability or unwillingness to rate education as an essential part of his professional services. Too often he hopes that this will be done for him by the Dental Board, the Government, or broadcasting, and fails to appreciate that the primary function of such bodies is to supply him with material which he himself should use in his surgery and elsewhere.

This truculent and narrow viewpoint must colour all the opinions formed during my tour, but it is hoped that the factual report will not be too obviously biased.

First, a brief travelogue. Landing in New York, I travelled through Philadelphia to Washington, D.C., interviewing in these places Federal, State, and municipal officers and experts; heads of clinics; academic notabilities; officers of the armed forces; research workers; executives of voluntary organizations; and influential private practitioners. Then my route lay to the deep South, through the Carolinas, Georgia, and Alabama, and northwards again into Tennessee. In these places—which I quickly learnt not to refer to as "the Provinces"—my contacts were mainly with State and county dental health departments, though I visited some dental schools and met several private practitioners. North again to Chicago, where I enjoyed the matchless facilities offered by the American Dental Association in collecting factual information and examining the educational material which it makes available. The courtesy of Dr. W. W. Bauer obtained similar facilities at the American Medical Association. From Chicago I travelled via Ann Arbor, interviewing the Dean of the Dental School and Principal of the School of Health Education of the University of Michigan, across the Canadian border to Toronto. There I was offered all possible help by the Canadian Dental Association and the University Dental School. For the brief balance of my time I returned to Philadelphia.

Everywhere I met with such unbounded friendliness, hospitality, and eagerness to help, that it seems invidious to single out any names from such a host of benefactors. But it would be even more churlish not to mention a few of those who at various times bore the brunt of acting as my keepers. I am especially indebted to the Secretary of the A.D.A., Dr. Hillenbrand, who arranged my itinerary, and to his staff at headquarters, and to the assistant Secretary, Dr. Camalier, in the capital. In the Southern States, Drs. Polly Ayers, John Chritzberg, Ernest Branch, and Carl Sebelius, and in Toronto, the Secretary of the C.D.A., Dr. Gullett, and Dr. Mitton. I am most grateful to the English-Speaking Union in New York, whose hospitality secretary, Miss Frances McPheeter, did so much to make me feel at home in that terrifying city.

But the greatest debt of all is owed to Messrs. D. & W. Gibbs. Their far-sighted munificence is without parallel on either side of the Atlantic, as is their unique ethical and socially responsible conception of their relationship with profession and public. I trust that modesty will not prevent this Society from accepting a few berries from these laurels.

My experience lay almost wholly in the larger centres of population: I visited no rural schools, because these were closed when I reached the Southern States, and those private practitioners I met were from highly populated urban areas and had financially high-class practices. An exhilarating exception was a dinner of a more rural district Dental Society in Tennessee: here I met my own counterparts, and learned that amalgam fillings are still used in the States, and that some dentists cannot afford a new Cadillac more than once a year. The timing of my visit could have been happier in view of my programme: by the time I reached Washington, the dental schools were either in the middle of graduation examinations or had closed down for the long summer vacation, and the public schools were closed for the same reason. This must be remembered if I seem sometimes to do less than justice to certain dental schools.

A coda to this lengthy prelude: I soon appreciated that the United States is a number 270

of virtually autonomous States, bound with varying degrees of adhesion by common interests and loyalties. My preconceived equation of Tennessee and Alabama with Somerset and Devon, only bigger, but still responsible to and bedevilled by absentee controllers in the seat of National government, was quite wrong. Thus, to speak of "American" practices in public health education is usually quite misleading: the practices of Illinois and Virginia may be no more alike than those of France and Israel. Finally, praise of American practices or institutions does not imply unfavourable comparison with their British counterparts, unless specifically stated.

AIMS OF DENTAL HEALTH EDUCATION

I would offer my own statement of the proper objectives of dental health education:—

1. To disseminate factual information;
2. To stimulate the public to adopt practices and form habits calculated to benefit dental health;
3. To encourage the public to accept dental treatment aimed at the maximum practicable maintenance or restoration of function and aesthetics compatible with the absence of infection.

The burden of the educational refrain is much the same throughout the United States, and may fairly be summarized thus:—

1. Visit the dentist regularly;
2. Brush the teeth regularly and correctly;
3. Eat the beneficial and eschew the harmful foods;
4. Value the deciduous teeth;
5. As communities, have your water fluoridated, and as individuals, have fluoride applied topically to your children's teeth;
6. Take an interest in the broad field of dental achievement.

With a general insistence on the influence of dental upon general health, these six aims constitute the practical objectives of most public dental educational activities.

But education cannot be considered wholly as an activity in itself, though most of this paper will be devoted to doing exactly this. It must be correlated to other inseparable factors. Nyswander says that "A forward-going dental

program is a triangular structure, the three sides of which are research, service, and education. Lacking any one of its parts, the triangle collapses" (Pelton and Wisan, 1949). Nyswander's elaboration of this thesis constitutes a definitive statement of the aims of any social approach to dental health. From available information, it seems that in Europe and America, only the Scandinavian countries achieve anything approaching the desired balance. Our own project teeters precariously upon the single limb of service, and across the Atlantic this is the very factor that is, for practical purposes, often signally lacking.

An account of research is beyond the remit of this paper. Perhaps one instance may illustrate the American approach to this: in Georgia, all public health laboratories in receipt of State grants must include research in their activities, not only for its own sake but because "it promotes in the staff that critical attitude towards methods and results without which an acceptable standard cannot be maintained".

Regarding service, public dental health educators in the United States know that, though treatment is usually available in some measure for really indigent children, and, far less frequently, for adults, a substantial proportion of the population will not seek dental treatment because of the cost. In *A Dental Health Inventory for Maintown*, published by the A.D.A., it is stated that, of all those parents who do not take their children to the dentist, 30 per cent excuse their negligence by lack of funds. The general attitude of many dentists seemed to be: "The mass of the population enjoy high wages and a good standard of living. They often prefer to spend their available means on television sets, automobiles, and high living: their dental negligence arises not through lack of means but through injudicious disposition of them, and it is a function of education to remedy this." I have neither the time nor the talent to offer a *critique raisonnée* of this oft-expressed opinion: the whole matter is considered in detail in a series of reports by the A.D.A. But the basic problem of relating potential demand to available services is seen in figures published by the

Federal Department of Health, Education, and Welfare: there is currently an estimated total of 850,000,000 cases of accumulated dental neglect, an annual increment of 196,000,000 cases, and only 98,000,000 cases of needs actually met annually. So if my account of dental health education in the United States occasionally savours of uncritical eulogy, its practical effects must always be measured against this immense ocean of neglected mouths. The situation was recently summarized by the American Dental Association, in a study of the availability of trained personnel (Status of Dental Personnel in the United States, 1954).

SPECIFIC ACTIVITIES

Some specific activities will now be considered in broad outline.

Federal Government.—The Dental Section of the Federal Department of Health, Education, and Welfare in Washington is directed by Dr. John Knutsen, one of dentistry's outstanding intellects and a pre-eminent authority on fluoridation. His departmental chiefs are all men of national status and experts in their own fields.

The services of the department are essentially advisory: the Federal Government exercises no authority unless funds are disbursed. The departments undertake research on such projects as the most effective use of dental personnel, the epidemiology of periodontal disease and malocclusion, and the effects of fluoridation. Pioneer fluoridation schemes were Federally assisted. A staff is engaged exclusively in the preparation of educational material, and thus invaluable data is placed at the disposal of those in more direct contact with the public. Individuals or teams from the bureau will visit any community on request to advise on all matters concerned with public dental health: to facilitate this, it has resident officers in various parts of the States.

It is the considered opinion of the department that the "backlog" of those requiring treatment is so colossal that for public health authorities to attempt to reduce it would be a waste of effort, and that their full resources should be directed towards preventive rather than corrective measures. This ideal does not

commend itself to all local politicians, many of whom see in statistics of fillings and extractions carried out for the indigent, a more concrete return for the expenditure of public funds than long-term preventive programmes.

States and Local Authorities.—The variety of attitudes towards dental health is limited, not by the number of States in the Union, but only by the number of Counties in each State and communities in each county. Arizona has no State dental officer at all. Tennessee has a dental surgeon as Chairman of the State Board of Health. In some States any public dental treatment is illegal; in Philadelphia every school child must by law be examined biennially—and each examination must last for at least twelve minutes. In an Illinois community, a dentist was appointed public health officer by public demand. Most State dental services undertake periodical examination, usually coupled with prophylaxis and topical fluoride application, which is, or should be, in itself a valuable educational service.

The educational activities of any State depend largely upon the individual genius and persuasive powers of its Director. In North Carolina, Dr. Ernest Branch, whose sense of vocation in the field of dental health education is almost evangelical, had to beg contributions from individuals and civic groups to augment his meagre State grants: out of this came the nationally famous puppet-show "Little Jack", which impressed me more than any single educational inspiration. Dr. Branch's barnyard philosophy makes every moment spent in his company a delight: on Motivation in Education, "If I was selling folks lightning-rods, I reckon I'd have to get them scared of lightning before they'd buy". Programmes are of necessity dependent upon budgetary limitations, though this is not immediately apparent to the casual British observer. But, just as the most lavishly equipped dental schools do not always produce the most accomplished graduates, so some State directors see in lack of funds a challenge to their mettle, and some of the most striking results may be seen in the poorer communities.

The State department usually prepares visual and other materials for the use of county

and other services. There is much activity in the provision of posters. They vary from the crudely amateur to the slickly professional, and presumably do some good, as that can be the only acceptable explanation of the huge and continuous output. Unless it is that people just like designing posters—any professional advertising agency will confirm that every business executive believes himself to be a heaven-inspired poster designer. Some fortunate States employ a whole-time Dental Health Educator. Georgia's Miss Annie Taylor numbers amongst her creations a series of books adapted to the various elementary grades, which have been adopted far beyond the State boundaries as reading primers. This would seem one admirable way of insinuating dental health education into the school curriculum.

The burden of seeing that State policy is implemented falls upon the county and municipal officers. They have more or less a free hand in the methods they employ, the State exercising control only in relation to such State grants as may be disbursed. Educational aids supplied by the State department of health, the A.D.A., and commercial undertakings, are commonly used, but the County department frequently has its own. In Jefferson County, Alabama, Dr. Polly Ayers has instituted many original ideas. Having access to all birth records, she is able to send a birthday card to every child in the county on its third and sixth birthdays, coupling good wishes with good advice. She and her staff write songs for class singing, and make out of papier mâché small exhibits, centred round such topics as space-men and cowboys and Indians, pointing dietetic and hygienic morals. This department and its director struck me as having an unusually deep sympathy with the mind of the small child.

The most intense and personal educational contact is provided by the regular examination of schoolchildren by dentists and hygienists. At its worst, this will merely conclude in the handing of a slip to the child to take to its parents, advising them that certain treatment is necessary and instructing them to make arrangements to have it carried out. At its best,

it is a real educational experience, the reasons for all advice being explained to the child, and, in some cases, its parents, as they may be invited to be present at the examination. Models and diagrams may be used and, as several children or a whole class may be in the room, a child's natural curiosity may be turned to good account and they will all be encouraged to have a look at the hole in Billy's molar and the green scum on Susie's incisors. There is a free-and-easy relationship between children and adults in America which lends itself to this sort of thing, and which explains many facets of the conduct of the American young viewed through British eyes.

The scope of a typical State Dental Department may be illustrated by the official "Objectives" of the Tennessee Division of Dental Hygiene:—

1. To promote a better understanding among all groups of the necessity for preventive as well as corrective dental care in the younger age-groups, and of the relative value of such services in the prevention of disease and the conservation of health.

2. To provide, insofar as may be possible, certain important and emergency services for school and preschool children whose parents are otherwise unable to secure these services.

The way in which the Division approaches these objectives has been summarized as follows:—

Objective: Strengthen a continuing program for dissemination of factual information.

Methods:

A. Courses and special projects.

1. Parent-Teachers Association Study Course.
2. Teachers' workshops and intensive training courses.
3. Children's Dental Health Day.

B. Lectures.

1. Schools and Colleges.
2. Civic Groups.
3. Professional Groups.

C. Educational Material.

1. Health Teaching Guide.
2. Preparation, evaluation, and distribution of dental health materials.

D. Use of films and visual aids.

E. Parent consultations.

1. Schools.

2. Child Health Conferences.

F. Mass Media.

1. Newspapers and periodicals.

2. Radio and television.

3. Exhibits.

To supplement these basic aims, thirteen specific "Two-Year Objectives" are listed, giving definite and attainable aims to what might otherwise be but a pious expression of generalized ambitions (*Dental Public Health Plan of Tennessee Department of Public Health, 1953*).

It has seemed worth quoting this at length, for it might well serve as a blueprint which, with little modification, could be adopted as a basis for combined discussion and action by our Ministry of Health and the responsible professional bodies.

It will be appreciated that the State department must be constantly active in the field of dental health education, and must show results of a kind apprehensible to politicians, yet must avoid interfering with the executive autonomy of county and community authorities and treading upon the corns of educational and private-practitioner interests. I spent long enough in Tennessee to observe the extent to which Dr. Sebelius has enlisted not only the sympathy, but the active support and co-operation, of the practitioners. The State Dental Society sponsors an annual "Workshop" on public dental health, a sort of intensive post-graduate course on community dental problems, which is very well attended and which gives private practitioners an opportunity to learn of the social problems related to their profession which exist outside their surgery walls.

The Dental Profession.—

The American Dental Association.—Article II of the Constitution of the Association reads: "Object: The Object of this Association shall be to encourage the improvement of the health of the public and to promote the art and science of dentistry."

The order is significant. The activity of the Association in the field of public dental health

education is constant, energetic, and widespread. Some activities are carried out independently from headquarters, but more through the constituent dental societies. It makes available a mass of educational material:

masse and individually. Its catalogue shows the extent of the educational material it can provide.

Publications: Printed educational matter is sold to members at cost price, but subsidies



Fig. 1.

visual and aural aids, printed and illustrated publications, model radio and television scripts and transcripts, and press hand-outs. It has whole-time health education and public relation officers (many State Dental Societies have the latter, who may act as lay secretary to the Society). It does in fact all in its power to offer to its members and affiliated bodies all possible facilities to educate the public, *en*

from the general fund of the Association are being sought so that some may be sold below cost. It is difficult to be critical of most of the publications. I had the opportunity of examining all those currently available, and could not imagine their being improved upon. The criteria of acceptability are that the matter should be authentic, should meet existing needs, and should be effective and suited to

various age-groups and intellectual levels. In addition to fulfilling these, they are almost invariably beautifully produced and printed. The greater part of the output is bought by State and local dental health departments for

provincial waiting-room, and at the end of four months had been handled to the point of disintegration. Small booklets explaining orthodontics, radiological examination, and similar subjects are widely distributed by

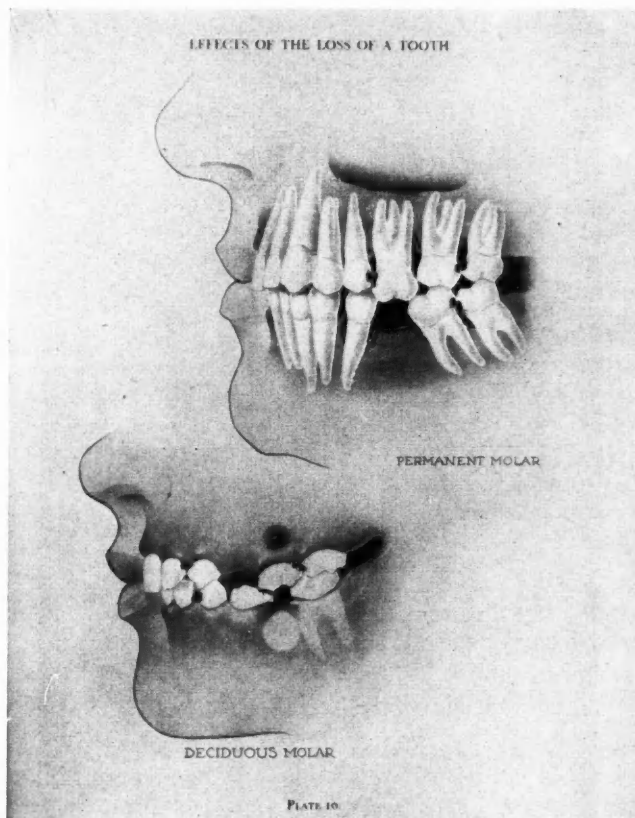


Fig. 2.

distribution and exhibition in schools and the community at large, but there is a large range of publications for the private practitioner. Of these, there are two substantial volumes: *Teeth, Health, and Appearance*, specifically designed for the waiting-room, and *Atlas of the Mouth*, which was not intended for this purpose but is largely used for it (Figs. 1, 2). New copies of each were placed in an English

practitioners, and must account for much of the shrewd technical knowledge possessed by so many American patients.

Of publications avowedly popular in appeal, the excursion into the field of the "comic" is the most interesting. The philosophy that, if crude pictorials are to be the staple intellectual pabulum of Young America then dental health education should cash in, has produced

"Daredevil Davey" (Fig. 3). This hideous publication is modelled with fiendish accuracy upon its revolting lay precursors, and could scarcely be bettered. Title, motif, and material are supplied by the Association to a firm of

treatment, and another which asserted that clean teeth make you beautiful. In this section the award must go to the Pennsylvania Department of Health's *Dental Instruction Handbook*, now happily out of print, which stated that

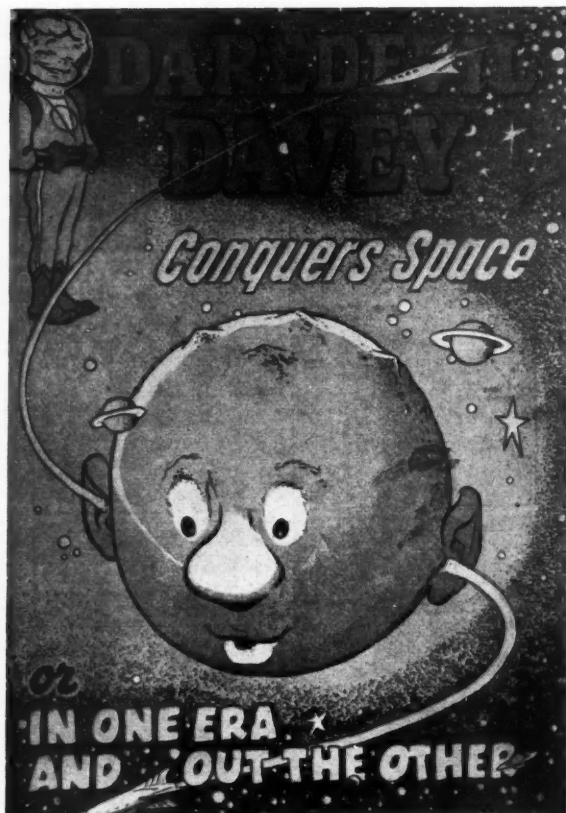


Fig. 3.

specialist publishers, who submit drafts for correction and approval, and eventually print the paper for distribution by the Association. It appears to be an unqualified success.

Revision of publications is constant. The Association must blush to recall some of its earlier indiscretions, one of which suggested that six out of eight lunatics taken from one asylum to the dentist were cured by dental

most enemies of society have irregular teeth (Irwin and Wilson, 1942).

Visual aids: Of particular interest to me were the aids to chairside education. Apart from booklets and charts, depicting the progress of decay, the developing dentition, correct tooth-brushing, and the like, there is a series of seventeen plaster models showing various normal and abnormal conditions, with

a graphic three-dimensional clarity. Alternatively, the moulds for pouring these models can be purchased. Latex models are available for rental, showing such features as results of thumb-sucking, progress of pyorrhœa, and value of diagnostic radiology.

Twenty-four sets of coloured slides may be hired, many of which are suitable for chairside instruction. Here I would mention that many surgeries are equipped with small projectors for this purpose. The Burton Company make one which can be attached to the unit, projecting slides and radiographs on to a small screen in view of the patient. Similar aids are available from other sources: the Densco Company make a superb, and extremely expensive, series of plastic models showing a wide range of normal and pathological conditions with great ingenuity and clarity. Other firms make large models of the mouth and giant tooth-brushes for demonstrating oral hygiene. These are an essential part of the equipment of all dental personnel giving class instruction.

The film library of the Association contains copies of most worthwhile dental health films, but only some thirty are listed as being currently available in the new catalogue of audio-visual material, itself a masterpiece of classification and indexing. I saw only a small fraction of these films and could not form an opinion upon the quality of health education films as a whole. Before purchase, all films are "vetted" by a panel of reviewers representing various branches of the profession. A passion for academic accuracy led to censure of an outstanding British film because the oral mucosa was compared to the delicate skin of a baby. A crude cartoon film prepared by the American Navy, in which fear is the chief motivation, finds admittance. Certain of the films have been cleared for television, and can be used in the same way as the radio transcripts. Films are produced by various bodies and individuals who may have either an altruistic urge, a financial incentive, or both. Certain commercial concerns specialize in the production of films of this nature. Instances are Coronet Films Inc. and Encyclopaedia Britannica Films Inc. The usual procedure in

making health education films is for the body sponsoring the production to brief a specialist company with the basic ideas and facts, and leave the detailed production to it. In this way are made the slickest and most finished productions. Occasionally an individual, or a State or municipal department, will undertake the whole project. Dr. Cohen, Director of the Philadelphia Schools Dental Services, has been personally responsible for a number of such films. Though they inevitably lack the professional touch, which places them at a disadvantage with an audience for whom the technical perfection of Hollywood is as maternal milk, it does permit precise direction at a known objective and with full cognizance of all local conditions. The problem so familiar in this country, of not having to hand an adequate projector, appears not to exist in American schools and civic groups.

The Association gives handsome assistance to dental societies participating in such functions as National Children's Dental Health Day. A large folder is supplied, containing copies of all relevant pamphlets, posters, and other literature for public distribution, and model scripts for radio and T.V. broadcasts. The bona fides of all applicants for these scripts are always checked by the Association before these are granted.

Public Health Education is a by-product of the Association's Public Relations Bureau. From this office flows a constant stream of information regarding dentistry in its social, political, and scientific aspects. News about all and every activity of the profession is here garnered, digested, and if considered creditable, handed out in suitable form to press and news agencies all over the country. The press turns to the bureau for confirmation of dental news items and for information generally.

State and District Dental Societies.—The main responsibility for implanting educational ideals in the general public is borne by the Dental Societies. One has a strong impression that every possible contact with the public is actively sought by the profession, in meetings of teachers, parent-teachers associations, civic groups, chambers of commerce, and wherever the message of dental health can profitably be

noised. The public wants to know, and the profession is eager to tell. My experience is that there is comparable public curiosity in our own country, but that as a profession we ignore it. Most Dental Societies have Speakers' Panels, one of the most valuable of all educational services. This panel will provide a speaker on any dental subject for any interested organization. It will provide a whole panel for public discussion on topics like fluoridation or restricting the sale of candy and carbonated drinks at school tuck-shops, and will send lecturers to schools and colleges. It must be said that the American dentist has not the almost morbid terror of public mention and appearance that ethical convention and national tradition have bred in his English colleague. If a dentist speaks on dentistry at a Rotary luncheon, his colleagues are more likely to applaud his public spirit than to yap at his heels and howl "Advertising!" Notwithstanding this, I could detect no evidence supporting any suggestion that, in general dignity and professional ethics, the American dentist suffers by comparison with the British. I admit that certain whole-page newspaper advertisements from a Western State, advertising such services as dentures on the easy-payment system, might be cited as exceptions to prove this rule, but the generalization stands.

This digression might be briefly continued in some observations on the American dentist's individual approach to the matter of dental health education. As evidenced by the free use of visual aids to chairside education, the good American dentist is a keen educator. In the first place, he shares the national trait of genuinely wanting mankind to be happy and healthy. This radiant goodwill to all men (except, in certain contexts, Communists) is one's ruling impression of the American character, coupled—almost paradoxically—with its terrible and remorseless energy and drive. Secondly, he is a salesman, and no shame attaches to the epithet. At a meeting of Temple University dental alumni, one speaker in a symposium on practice management stated that the greatest salesman of all time was Jesus Christ. This—to me—

startling assertion evoked neither gasp nor titter from a respectful audience. It is widely accepted that the salesman has helped to make America. He is a public beneficiary of the first order, and numerous University faculties exist in furtherance of his honoured vocation. The dentist, in advocating a tedious and expensive course of periodontal treatment as an alternative to the forceps, is conscious that he is performing a valuable educative service. The moral that lies behind this conviction gives the American profession a poise and assurance that we cannot but envy.

To return to Dental Societies, only to digress again. An annual event, in which all Societies play an energetic part in sponsoring, is "National Dental Health Week". This originated in Cleveland, Ohio, seven years ago, as a mere day, but its success was such that it was taken up by the A.D.A. and expanded into a week. It is now a national institution. For that week, every community becomes acutely dentally conscious. In every township it is officially inaugurated by a civic "bigwig", and State Governors, and even the President himself, give it public blessing. State health departments may allocate funds to further its success. Schools are the main centres of activity: periods devoted to dental education are augmented; visiting dentists address classes; forms, schools, and individuals are awarded anything from buttons to banners for their response to official exhortations to visit their dentists, for essays on dental topics, and for artistic projects with a dental motif. The press, broadcasting, and T.V. play with a will. Both in free time and in commercial time donated by advertisers, dental programmes are given, sometimes original and local, sometimes with material provided by State, Association, or Federal departments. "Spot Announcements" enliven the broadcasts: between the andante and the scherzo of your favourite sonata, an earnest voice will cry "Do you know that more teeth are lost each year by gum trouble than by decay? Visit your dentist regularly, so that he can prevent the gum trouble from happening".

The general assistance given by the A.D.A. has already been mentioned.

The Dental Societies provide the principal public relations contact with the press: this is so important a function that many societies have whole-time public relations officers. Press hand-outs are distributed liberally. The equivalent of our section meetings are reported in local papers, and the larger conferences are very thoroughly covered.

The Dental Schools.—Dental Health education in its preventive aspects does not in general secure the active support from the schools that I had expected. Lip-service is paid to the ideals, but save in some periodontal departments, I saw little evidence of earnest activity. The periodontal department of Howard University appears to be unusually thorough. Under the guidance of Dr. Henry and his staff, the students are divided into groups of ten and each student is in turn the subject of home-care demonstrations. Every patient attending the department is expected to bring a toothbrush. At Temple University, all children attending the Paedodontics Department brush their teeth at a communal cuspidor under surveillance of hygienists. Several eminent practitioners acknowledged the shortcomings of the schools in this respect, the periodontists in particular bitterly ascribing it to the disproportionate place given in the curricula to the mechanistic conception of dentistry. That, in the words of Dr. J. Roy Blaney, being the subject with which the Deans can ring the cash registers. Dr. Blaney's views are forthright, and I would attempt to paraphrase them. Public ignorance is deplorable, and the remedy lies with the Schools. A student should be given credit towards his final grading for activity and competence in the field of patient education and instruction, just as he is for inlays and bridges. The ideal would be for the student to make contact with a whole family unit early in his career, to study minutely the economic and physical background, even to the point of visiting the home, and to advise the family as to how its dental imperfections arose and how to take full advantage of present knowledge of preventive medicine.

Dr. Blaney's pioneer work in the conception of the social case worker in dentistry (Wexler

and McKinley, 1953) is in itself a major contribution to health education. No United States school has yet approached his ideals, but the University of Illinois is making a tentative move in allocating family units to students for consultation and advice.

The school which had a conception of education as a factor in preventive dental medicine far in advance of anything which I personally experienced in the States was that of the University of Toronto in Canada. The department of Preventive Dentistry is headed, not by a dentist, but by a paediatrician. A full-time nutritionist is available for consultation with student and patient and also, incidentally, with general practitioners, and the student has to go through this department before he ever looks at the teeth as a practising dentist. Dr. Mitton is a major force in this department, and has initiated some interesting projects. Dental students in their final year are taken three at a time to welfare clinics for the expectant mother, where they witness in turn the doctor, nurse, and dentist counselling her on her responsibility towards the child's health, nutrition, and habits.

A series of eight cards, bearing large photographs showing normal and abnormal eruption, use of space maintainers, correct brushing, etc., are an obligatory part of the student's kit. This provides a stimulus to the general use of visual aids in chairside education, and is most valuable (*Fig. 4*). Dr. Mitton plans a complete patient-education department. A room into which a student shall take a patient, discuss his problems, and instruct him: the whole proceedings to be recorded on a concealed instrument and played back at a seminar, where it would be criticized and discussed by class and teacher. This has been tried with success on some final-year students, and will be included in the curriculum when the school moves into larger premises.

Dr. Mitton has carried his ideas into the field of public health. I would mention one particularly happy inspiration. Classes of schoolchildren are encouraged to keep a pair of tame rats, as near identical as possible. One is fed upon the rodent equivalent of the "Norwegian Breakfast", and the other on

sugar and spice and all things nice. It becomes very quickly apparent to the children that the Spartan diet produces a healthy, active rat, whilst the gourmand soon develops all manner of ailments, dental and general, which can

One other dental school gesture must be mentioned. At the University of Michigan, all dental students are met once by a faculty member from the School of Health Education and are told how to make their clinical

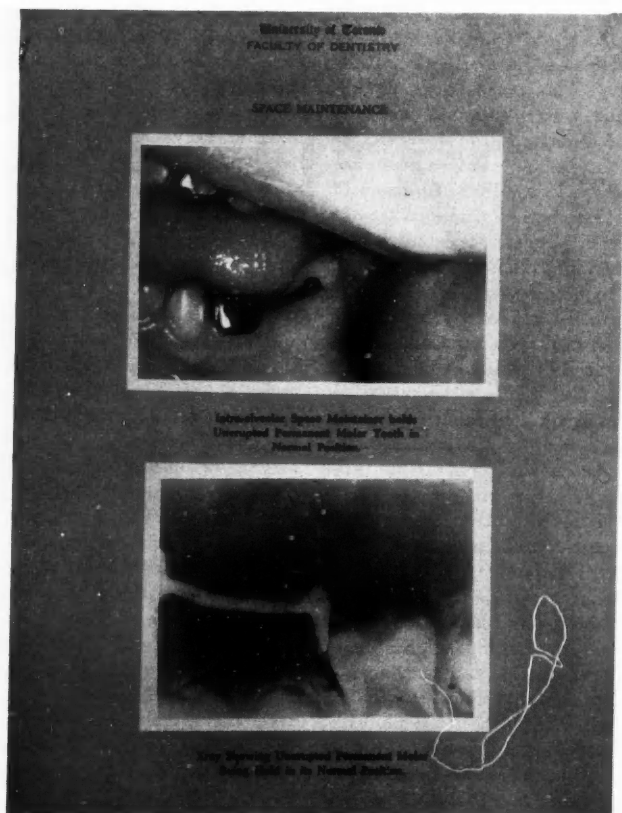


Fig. 4.

either lead to premature demise or else, with a reformation of diet, a snatch from the grave. I feel that these homely and highly individual approaches have too small a place on either side of the Atlantic, and that the personal experience of a pet rat developing caries and losing weight because of ill-advised diet would do more to inculcate a respect for sound dietetic principles than all the films and posters ever produced.

experience an educational one for the patient. It may be added that the Hygienists trained at that University have a far more extensive contact with the School of Health Education and are competently, if still inadequately, educated in the art of education.

The Armed Forces.—The Forces possess an immense educational potential which they can exercise upon the young men passing through

them under the national service system. In response to my inquiry about the way in which they measure up to this responsibility, I was privileged to meet at a luncheon in Washington the dental chiefs of all three services, and also Dr. Rault, now Dean of Georgetown University Dental School, but formerly of equal fame as an Admiral. I was assured that the services took this responsibility very seriously, and that every man is, from enlistment to discharge, subjected to constant dental education. It was claimed that there is abundant evidence of this in the way in which national service men, neglectful of their mouths before being drafted, seek dental treatment after their discharge.

I may be forgiven for wishing to confirm for myself whether the assurances given on Olympus were justified by what actually happened down below, by witnessing a concrete demonstration of educational work in a service clinic. This unworthy scepticism led to one of the most rewarding experiences of my tour. By courtesy of Captain M. M. Maxwell, D.C., U.S.N., I visited the dental clinic at the Naval Gun Factory in Washington. Here I saw what was unequivocally the best example of chairside education I have seen anywhere. The educator was Captain C. T. Pridgeon, U.S.N., a periodontist whose hobby is education. Himself a superb clinical photographer, he has a magnificent range of transparencies, which, reinforced with radiographs and models, he used to subject his patients to an intensive and practical educational experience superior to anything seen elsewhere. His approach varies according to the material in hand, and its effect derives much from his own personality, so an account of it is impossible. His set of full-mouth radiographs showing periodontal degeneration, and labelled "Going, Going, Gone!" is one of his felicitous ideas. He has also prepared an admirable little pamphlet for general distribution, and an excellent stock lecture, in an easy, colloquial style, integrated with a specific set of slides, which is available to his colleagues and subordinates wishing to address lay audiences. I would not be so naïve as to believe that this one example is typical of the

United States Forces in general—practical idealists of the stamp of Captain Maxwell, and inspired and enthusiastic health educators of the calibre of Captain Pridgeon, could not possibly find many counterparts in so imperfect a world—but much that I have heard and read confirms my belief that in the United States the Armed Forces dental services constitute an important health education service. An impression of virtually unlimited funds prevails.

Public Schools.—The regular dental inspection of school children, which obtains in most States, has already been noted. The success of this as an educational measure should be measurable with some degree of precision from the returns of children who do in fact receive dental treatment after being advised to do so. They are usually given forms of some kind, returnable to the school when treatment has been carried out, and detailed records are kept by the local authority. I was informed that in some instances indirect coercion is brought to bear upon children who do not seek attention, by restricting promotion and graduation. My impression was that, though this practice is almost certainly carried out, it is not official policy and would be discountenanced in political circles.

There is generally didactic instruction in dental facts and hygiene. This may be given in periods specifically devoted to health education, or may be integrated with other subjects, and crop up in science, art, and other lessons. Didactic instruction may be given either by the teacher, or by a dentist or hygienist. In the former case the teacher will probably have had a course of instruction, organized by the State dental department, and will make use of material supplied by the department, the A.D.A., or by certain commercial concerns. A pamphlet, *Teach Dental Health*, published by the Bristol-Myers Co., appears to be widely used, as are wall-charts prepared by such dentifrice manufacturers as Kolynos and Ipana. If the lessons are given by hygienists, they will have received instruction on teaching methods as a part of their training. Similar training would have been given to dentists with specialist qualifications

in public dental health. There is considerable division of opinion as to which is the better method. One faction holds that the teacher is the better qualified to teach her own pupils, whatever the subject; and the other, that teachers have quite enough to do already and if dentists want dental health taught, they can do it themselves. I had short experiences of both methods in action, too slender to justify a considered opinion. The teachers' approaches were more simple and direct, avoiding the tendency to talk down to the children: the hygienists, though keen and earnest to a degree, displayed a saccharine patronage. Some schools have teachers specializing in physical education. He or she will be responsible for all health and hygiene instruction, and for remedial exercises as well as normal "P.T." If such a teacher should be an enthusiast for dental health, the school is particularly happy. At a school in a poor and mainly coloured district in Philadelphia, I witnessed the daily communal tooth-brushing. At two fountains in the basement the children brushed their teeth by classes, generally supervised by the physical education master but in effect run by a few selected children, granted the title of Dental Assistant and clad in white caps and coats. Dentifrice was supplied gratis by the manufacturers as part of an experiment to determine the value of certain ingredients as caries inhibitors. Each child used the same dentifrice consistently, and the tubes were identified by numbers. The key to the contents was held only by the manufacturers and by the Director of the Schools Dental Services, Dr. Abram Cohen. A preliminary summary of the findings has recently been published (Cohen and Donzanti, 1954). The competitive spirit is frequently fostered: individual children may be given little merit awards for dental diligence, classes will compete for trophies, and schools for banners. It might be noted that in Philadelphia, the Schools Dental Service, a department of the Division of Health, Education, and Welfare, concentrates its energies upon examination and prophylaxis, education, and propaganda: the onus of providing any necessary treatment for the indigent falls upon the Public Health Officer.

Parent-Teacher Associations.—Working in close co-operation with the schools is the nation-wide P.T.A. In some schools, one hundred per cent of parents are in membership, and membership does not cease when one's children have left the school: in fact, parenthood is not a necessary qualification. It is particularly strong in rural areas, where the school is the centre of the community's social and cultural life. The parent members co-operate willingly in any project intended to further the children's interests, and many are keen enough to attend study courses on child dental health. In some districts where there is a shortage of trained dental staff, members will act as assistants to the visiting dentists and hygienists, doing the clerical work and giving practical assistance during topical fluoride application.

The majority of public dental officers stated that the Association was a potent help in putting over dental health propaganda, and freely acknowledged the assistance, personal and financial, that was so generously forthcoming. A disgruntled minority considered it an infernal nuisance, being now so powerful that it could, and does, influence executive policy and interfere in matters beyond its competence.

The Press.—On the whole, dentistry gets a good press in America. There are a few papers published in New York, Washington, and Chicago, that could be called national, but they are not comparable with our national daily and Sunday papers, and their effective influence extends little farther than their cities of origin. The papers that count are the local ones. In Tennessee there are thirty daily papers, ranging from the Memphis Commercial Appeal, with a circulation of 198,000, to the Paris Post Intelligencer with 3,906. Newsprint is superabundant, and editors are often only too glad to print anything of real interest from reliable sources. Consequently the public relations officers of Dental Societies and the A.D.A. are kept busy drawing up press hand-outs and circulating them to editorial offices and press agencies. Professional meetings of any consequence are well reported, and major conferences make the front pages. There is

the keenest interest in our own National Health Service, as evinced by the frequency with which reporters sought out the writer and demanded information. The lay public was every whit as eager to learn about the Service as were the dentists, and the shrewd questioning which would follow the publication of an interview was further evidence of the way in which the public looks to the press for information on health matters. American misconceptions regarding the British National Health Service or, as it is invariably termed, "socialized medicine", would supply matter for a lengthy and hair-raising paper.

The huge bulk of the American daily paper gives rise to misgivings as to how much of it is actually read. The whole of it would be read only by an invalid or a press-cutting agent, but it is divided conveniently into detachable sections calculated to appeal to various interests. The busy captain of industry would probably throw away five or six sections, retaining only those bearing the political news, financial reports, sporting information, and comic strips. The housewife would jettison all but the women's section, which would, if read thoroughly, leave her no time for chores, hence perhaps the popularity of mechanical helpmeets in the kitchen. Thus, an item of dental news printed in a daily paper would probably not be read by more than a proportion of the purchasers. If it seemed to apply particularly to the health of the child, it would probably appear on the women's page; if it related to increased public expenditure on the State or municipal dental services, it might feature in a section not commonly perused by housewives and college students. Real front-page stuff of dental origin is rare: a national conference held in the paper's locality, or an assault by a dentist upon a female patient, occasionally achieve this prominence. But there is a good, steady appearance of dental news in the papers generally, both stimulating, and responding to, public interest in dental matters. I was most impressed by the scientific knowledge displayed by some of the reporters with whom I spoke, and I formed the opinion that this knowledge was ill served by the unlovely

journalese in which convention demands the reporting of their experiences.

Periodicals carry occasional articles on dental subjects, of a type suitable to their character. Women's beauty magazines are particularly well served: one practitioner had in his waiting-room a file of articles culled from such magazines, which I was able to examine at leisure. Many were beautifully illustrated, and some authoritatively written in terms more technical than one might expect. Such specialized topics as the use of oversize jacket crowns for the correction of median diastemata, and the advantages of gold over amalgam fillings, were covered fully and fairly. The innate scientific curiosity of the American is catered for by innumerable periodicals, and dental science is featured about as often as it deserves. The introduction of the airbrasive technique received a considerable press, and the recent supersonic drill has been mentioned. Some periodicals have considerable influence. Particular mention might be made of *Readers' Digest*, which is regarded by many as the final arbiter on scientific matters, and many a patient has assessed his dentist's worth by his conformity with the tenets set forth from time to time in that publication.

Radio and Television.—Broadcasting is run essentially by and for commercial interests, but all stations appear to grant periods of "free time", which is placed at the disposal of political, social, religious, and such concerns as may be of public interest and benefit. Whether this is by legislation or gentlemen's agreement, I did not ascertain. As far as I could see, this time was generously distributed and the dental profession welcome to as much as it could reasonably use, though not at peak hours. A New York dental society has a regular dental hygiene broadcast at 10.30 a.m. District dental societies make good use of the time and if local inspiration runs dry, there are scripts available from the A.D.A. and elsewhere as well as transcripts on gramophone records from the same sources. I did not hear any non-commercial dental health broadcasts or transcripts, though I read some of the scripts. Dramatic or dialogue form is favoured, in preference to the unassisted monologue

—"The majority of Health Talks are deadly . . . a good program director avoids them like the plague"—(Dwyer and Graver, 1945).

The effect of commercial broadcasting is difficult to assess. If making the public aware that their teeth are worth looking after is a function of dental health education, as it must surely be under any broad interpretation of the phrase, the dentifrice "commercials" are the most potent media of mass dental health education in the States, but their motives and veracity are, with delicate euphemism, suspect. The claims made for magical ingredients must be heard to be believed, as must the relentless intensity of the "commercials" themselves. In principle, the whole thing is deplored by the profession, but most practitioners grudgingly admit that the total effect has been to make the public far more tooth-conscious. Many advertisers throw a sop to the profession by exhorting their audience to visit their dentists regularly, though the public might wonder why this should be necessary in view of the claims previously made for the nostrum. Official circles are genuinely concerned at the difficulty in providing counter-propaganda. Once the A.D.A. used to grant to certain tested dentifrices the right to bear a stamp denoting professional approval, but were forced to admit that for all practical purposes this was quite ineffectual, and the scheme was withdrawn.

General Advertising.—Much that has been said about commercial broadcasting applies to advertising generally, but there are more instances of good intentions. Some dentifrice manufacturers produce excellent models and brushes for demonstrating oral hygiene, and literature to aid teachers in imparting dental health education. The Dairy Council publishes good posters which are freely used by public health services, though the Council's advocacy of ice cream inhibits whole-hearted approval of its propaganda. Numerous other concerns publish literature and posters of unimpeachable virtue, but they are frequently decidedly inferior to similar publications produced by the A.D.A. and State and Federal Departments. They have, however, the great merit of being free or extremely cheap.

One is struck, not by any startlingly novel technique of advertising, but rather by the sheer intensity and volume of it. Posters are bigger and more ubiquitous, neon lights are brighter, whole-page advertisements more common. There is no doubt that the American public is constantly subject to a barrage of advertising in every field, the ferocity of which we cannot begin to imagine. The surprising thing is that it appears to be effective: one would have thought that by this time the public would have developed a resistance. But every time a new ingredient is introduced into a dentifrice and a stunt sales campaign inaugurated, up go the sales. It is noteworthy that the sales of the new product go on top of those of the previous standard product, the sales of which remain constant. Does that mean an increase in the number of people who brush their teeth or do the confirmed brushers just use more? I found no answer to that. The total increase in dentifrice sales was no less than 30 per cent over two years. The sales appeal is both positive and negative: to good looks and good health; to ugliness, bad breath, and ill health. These in themselves are much the same as those with which the more disinterested exponents of dental health education appeal to their public.

Health Educators.—At least nine universities in the United States give degree training in Health Education. The minimum requirement for admission to most schools is a bachelor's degree in arts or science. Graduates are employed by State and local authority health services, and by the many voluntary health associations that are so potent a force in American health education. A few are consultant private practitioners, and might be employed by a community considering the installation of, say, a fluoridation plant, to organize the general publicity and educational campaign prior to putting the matter to a public referendum. They have special knowledge of the technique of preparing audio-visual material, and other media of mass and intimate educational material. In some cases both medical and dental services of a State have their educational programme subject to

the general supervision of a State Health Educator. Other states employ health educators in the dental department itself: the instance of Miss Annie Taylor has been cited. The work of this corps of professional health educators throughout the States is remarkable, and outstanding contributions have been made by many of them to the literature of health education. One notes with great satisfaction that London University has recently inaugurated a course for health educators.

Dental Hygienists.—Without the hygienist, the school dental educational programmes of most States would be quite impracticable. They carry out examinations, give classroom instruction in oral hygiene and in elementary dental science, and are instrumental in preparing much of the visual and other materials used. In addition to the technical and academic training necessary for practical chairside and office work, their course includes such subjects as psychology, sociology, education, speech nutrition, and dietetics, instruction in these topics usually being given by the appropriate faculty of the university. Their work in the field of public health is quite invaluable, and their increasing employment in private practices means that much of the individual dental health education of private patients is in their hands. In particular, periodontists entrust the teaching of home care to them. The licensing of hygienists was once bitterly opposed in America, and they still have their detractors, but if a really effective programme of dental health education is to be carried out in any highly-populated country, it would seem that the hygienist, or that rose by some other name, is absolutely indispensable, and is needed in large numbers at that. The output of the existing schools in America does not approach the demand.

Industrial Dentistry.—To my regret, I was unable to investigate the subject of industrial dentistry. I would have liked to know whether there are any schemes for the routine examination of employees, perhaps similar to that practised in this country by Messrs. Marks & Spencer Ltd. Towards the end of a convivial gathering in the backwoods of Tennessee, I met an industrial dentist, but was unable to

ascertain the nature and scope of his work. "Clip-sheets" are provided by the A.D.A. for inclusion in factory and office newspapers, and I was informed that health talks are given over the loudspeaker systems in some factories. It seems most unlikely that the possibilities of dental health education in this field have not been exploited in so tooth-conscious a nation, and it would be a fruitful field for study on a future occasion.

Miscellaneous.—Our young have access to toys and properties enabling them to play such roles as bus conductors, grocers, nurses, and spacemen. I have not yet seen in this country "Let's Play Dentists", exhibited in a Philadelphia store, consisting of a miniature unit, mirror, sundry instruments, and white cap. Perhaps Saki's *Toys of Peace* should be compulsory reading for parents who give this outfit to their children: frightful consequences are foreseeable, but it at least argues a lively interest in the subject. More questionable are tiny replicas of full dentures marketed by one manufacturer, and advertised in a dental periodical. The dentist is advised to hand sets to his friends, with a jovial comment to the effect that if they do not visit him regularly, this will be their fate. I do not think that these fripperies should be dismissed too lightly: Even if they cannot be properly rated as educational material, they presuppose an awareness of the importance of dental health in the public, and help, though in a manner lacking in dignity, to heighten this consciousness. And it may have been remarked how American radio comedians in this country, indulging in the broader personalities, invariably refer to "bridge-work", whereas our native red-nose comics would surely say bluntly "false-teeth". This, of course, is not just a transatlantic genteelism. It means that the American, missing a tooth or two, will have them replaced, as often as not, by precision prostheses rather than by the periodontist's nightmares affected by our public. Moving among the middle-classes as I did, though my contacts with the lay public were restricted, I was acutely aware of an infinitely higher standard of dental consciousness than exists on a similar level here. Far more children

with orthodontic appliances, far fewer anterior cavities or grubby and obvious restorations, far more glimpses of bullion in the posterior regions, and far fewer full dentures in the young middle-aged groups. To discover the reasons for all this was my own personal justification, as a practising dentist, for undertaking this quest, coupled with a sincere wish that my own countrymen should enjoy a higher standard of general well-being, as distinct from mere freedom from tangible disease, to the enjoyment of which a comely and functional natural dentition can contribute so much. I wish I could believe that I have found the reasons: I am conscious that I have hardly scratched the surface of the problem. But if any of my observations may stimulate, however indirectly, the formation of speakers' panels, the demand for chairside educational aids, or an insistence upon competence in patient education by just one dental school, I shall feel that Messrs. D. & W. Gibbs will not have cast their bread in vain upon the waters.

I would like to re-assert the vital importance of dental health education in our own society, and cannot conclude better than by quoting a shrewd Canadian observer of the National Health Service: "However, it appears that an energetic program of education will be necessary, if the desired purpose is to be achieved. Health education of the public cannot be accomplished with any degree of suddenness, even when attempted by legislation. Well-founded opinion is to the effect that intensive health education should precede action, which was not done in this plan. Experience in other plans has shown that once large-scale treatment is instituted, health education becomes a lost feature of the program" (Gullett, 1949).

This is a just and damning indictment, but the very existence of these scholarships shows that in one quarter, at least, the implied challenge has been accepted.

SUMMARY

Federal, State, and local public dental services are concerned primarily with educative and preventive measures: corrective treatment, when available, is for the indigent.

The American Dental Association emphasizes the importance of dental health education, and makes available a wealth of material to further it.

Dental schools place insufficient emphasis upon the duty of the student to instruct patients in preventive measures.

The individual practitioner is usually alive to the possibilities of dental health education in his surgery, particularly regarding corrective treatment, and use is made of models, pictures, and other visual aids.

The profession in most localities is active as a body in educating the public.

The press, radio, and television combine to keep dentistry in the public eye. The benefits of most forms of commercial television are questionable.

The employment of adequately trained hygienists is necessary for any large-scale dental health education programme in the schools.

The American public is more alive to the importance of dental health than is the British, and is technically better informed.

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